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ABSTRACT

This report addresses the opportunities offered by technological advances to improve the dissemination of federal information and highlights two major problems: maintaining equity in public access to federal information in electronic formats, and defining the respective roles of federal agencies and the private sector in the electronic dissemination process. In addition to providing an overview of federal information dissemination, the report discusses: (1) key technology trends relevant to federal information dissemination, including information systems integration, the microcomputer revolution, the continuing role of paper and microform, electronic publishing, online information dissemination, optical disks, expert systems, and technical standards; (2) the current and future roles of the U.S. Government Printing Office (GPO) and the Superintendent of Documents, the Depository Library Program--administered by the GPO--and the National Technical Information Service (NTIS); (3) the electronic dissemination of congressional information; (4) the Freedom of Information Act in an electronic age; (5) the electronic press release and government-press relationships; and (6) the federal information dissemination policy in an electronic age. Four appendixes contain acknowledgements of the contributors to this report and contributing authors, a list of contractor reports, and explanations of some key terms and definitions. (Information formats considered include paper, microfiche, computer tapes and diskettes, compact disks, and online databases). (CGD)

ED301228

INFORMING THE NATION

Federal Information Dissemination in an Electronic Age

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INFORMING THE NATION

Federal Information Dissemination in an Electronic Age

UNITED STATES CONGRESS OFFICE OF TECHNOLOGY ASSESSMENT

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Foreword

Federal information is essential to public understanding of many issues facing Congress and the Nation, and is used by all sectors of society. Technological advances are opening up many new and potentially cost-effective ways to collect, manage, and disseminate this information. Although traditional ink-on-paper publications will continue to meet important needs for the foreseeable future, many types of Federal information—such as statistical, reference, and scientific and technical—are well suited to electronic storage and dissemination. For example, an entire year's worth of the *Congressional Record* or several Bureau of the Census statistical series can be placed on one compact optical disk that can be easily read with a low-cost reader and basic microcomputer. Press releases, weather and crop bulletins, and economic or trade indices can be disseminated immediately via electronic bulletin boards or online information systems.

This report addresses the opportunities to improve the dissemination of Federal information. It also highlights two major problems: maintaining equity in public access to Federal information in electronic formats, and defining the respective roles of Federal agencies and the private sector in the electronic dissemination process. The report focuses on current and future roles of the U.S. Government Printing Office (GPO) and Superintendent of Documents, the Depository Library Program (administered by GPO), and the National Technical Information Service (NTIS). In addition, this report examines electronic dissemination of congressional information, the Freedom of Information Act in an electronic environment, and electronic dissemination of government information to the press.

In conducting this assessment, OTA drew on expertise and perspectives from numerous sources in and outside of the government. OTA received special assistance from the General Accounting Office (GAO) for the surveys of Federal information dissemination practices and Federal information users, from GPO with respect to Federal printing and related dissemination activities, and from NTIS with regard to dissemination of scientific and technical information. OTA appreciates the participation of the advisory panelists, contractors, working group participants, Federal agency officials and Federal information users who responded to the GAO surveys, and members of the library, academic, business, labor, consumer, and Federal agency communities, among others, who helped bring this report to fruition.

The report responds to an initial request from the Joint Committee on Printing and subsequent expressions of interest from the Subcommittee on Government Information, Justice, and Agriculture of the House Committee on Government Operations, the House Committee on Science, Space, and Technology, the Committee on House Administration, and the Subcommittee on Legislative of the House Committee on Appropriations.

The report is solely the responsibility of OTA, not of those who assisted us in the assessment or of the congressional committees who requested or endorsed the undertaking of the study.

John H Gibbons

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Chapter 1
Summary

Photo credit: U.S. Department of Agriculture

Farmer using a videodisk with self-help and financial planning programs from the Extension Service.

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Chapter 1

Summary

INTRODUCTION

> If a Nation expects to be ignorant and free in a state of civilization, it expects what never was and never will be . . . if we are to guard against ignorance and remain free, it is the responsibility of every American to be informed.
>
> *—Thomas Jefferson, July 6, 1816*

Federal information is used by all sectors of society. For example, the business and financial communities look to price levels and government indicators of economic activity as important inputs to business planning and investment decisions. Similarly, the agricultural community regularly uses government crop and weather bulletins, as well as forecasts, to aid in scheduling crop planting. Scientists and engineers benefit from technical information generated by federally conducted or sponsored research in areas like superconductors, supercomputers, and solar energy. Indeed, information generated by the Federal Government spans the entire spectrum of issues and programs relevant to agency missions—from public health crises, such as AIDs; to environmental problems, such as hazardous waste disposal and water pollution; to demographic and employment trends. And at the most basic level, information about governmental processes—such as the *Congressional Record* for Congress and the *Federal Register* for the executive branch agencies—is used by citizens and organizations that wish to monitor and participate in a wide range of government activities.

For most of this Nation's history, Federal information has been disseminated predominantly in the form of paper documents and, in recent decades, to a lesser extent in microfiche. However, in the last few years, technological advances have resulted in a rapid increase in the use of electronic formats for Federal information dissemination. While the use of electronic technology offers many new opportunities for cost-effective dissemination, serious conflicts have arisen over how to maintain and strengthen public access to government information and balance the roles of individual Federal agencies, governmentwide dissemination mechanisms, and the private sector.

OTA has concluded that congressional action is urgently needed to resolve Federal information dissemination issues and to set the direction of Federal activities for years to come. The government is at a crucial point where opportunities presented by the information technologies, such as productivity and cost-effectiveness improvements, are substantial. However, the stakes, including preservation and/or enhancement of public access to government information plus maintenance of the fiscal and administrative responsibilities of the agencies, are high and need to be carefully balanced by Congress.

Congress has enacted numerous laws that emphasize the importance of broad public access to Federal information (such as the Printing Act of 1895, Depository Library Act of 1962, Freedom of Information Act of 1966, and Paperwork Reduction Act of 1980) and assign various information dissemination functions to individual Federal agencies (see box A) and governmentwide clearinghouses. The latter include principally the Superintendent of Documents (SupDocs) at the U.S. Government Printing Office (GPO), Depository Library Program (DLP) also at GPO, National Technical Information Service (NTIS), and Consumer Information Center (CIC). However, the existing statutory and institutional framework was established by Congress largely during the pre-electronic era. It is important, therefore, that Congress review this framework to determine what actions are needed to ensure that legislative intent is carried out in an electronic environment and whether any adjustments in legislative objectives or legislation are needed.

Box A.—Information, the Lifeblood of the Federal Government

Information is truly the lifeblood of many Federal Government programs and activities and is essential to the implementation of agency missions as well as to informed public debate concerning such programs and activities. Congress has enacted hundreds of specific laws that assign information dissemination and related functions to Federal agencies. Some illustrative laws include:

- Public Law 96-374, Education Act Amendments of 1980, Department of Education to establish an information clearinghouse for the handicapped;
- Public Law 96-399, Housing and Community Development Act of 1980, Department of Housing and Urban Development to collect and report data on sales prices for new homes;
- Public Law 96-482, Solid Waste Disposal Act Amendments of 1979, Environmental Protection Agency to collect, maintain, and disseminate information on energy and materials conservation and recovery from solid waste;
- Public Law 97-98, Agriculture and Food Act, Department of Agriculture to develop an agricultural land resources information system and to establish relations with foreign agricultural information systems;
- Public Law 97-290, Export Trading Company Act of 1982, Department of Commerce to disseminate information on export trading;
- Public Law 98-362, Small Business Computer Crime Prevention Act, Small Business Administration to establish an information resource center on computer crime;
- Public Law 99-412, Conservation Service Reform Act of 1985, Department of Energy to disseminate information annually to States and public utilities on residential energy conservation; and
- Public Law 99-570, National Antidrug Reorganization and Coordination Act, Department of Health and Human Services to establish a clearinghouse for alcohol and drug abuse information.

SOURCE: Congressional Research Service and Office of Technology Assessment, 1988.

This assessment presents information and analyses on a broad range of topics and issues. It is intended to:

- help both Congress and the Nation better understand Federal information dissemination in an electronic age; and
- assist Congress in implementing improvements in Federal information dissemination activities.

The focus of this report is on public information, that is, Federal information that is or should be in the public domain and is not subject to exemption under the Freedom of Information Act (e.g., due to privacy, security, or confidentiality considerations). The report focuses on the process of information dissemination, including the Federal Government's technical and institutional infrastructure for dissemination, not on information collection (although also important). The report considers a wide range of information formats—from paper and microfiche to computer tapes and diskettes, compact disks, and online databases. And the report covers all major types of Federal information at a general level—including agency reports and pamphlets, rules and regulations, periodicals and bibliographies, statistical information, and scientific and technical information, among others.

OPPORTUNITIES

The Federal Government today stands at a major crossroads with respect to the future of Federal information dissemination. Technological advances have opened up many new and potentially cost-effective ways to disseminate Federal information, especially those types of information (such as bibliographic, reference, statistical, and scientific and technical) that are particularly well suited to electronic formats.

OTA expects several key underlying technical trends to continue unabated for at least the next 3 to 5 years and 10 years or more in many cases. These include:

- continued, steady improvement in the price/performance of microcomputers, nonimpact printers, scanners, and desktop software;
- rapid proliferation of desktop publishing systems and continued improvement in the ability of desktop systems to produce higher quality, more complex documents;
- rapid growth in networking of desktop and high-end systems, nonimpact printers, and phototypesetters used for more complex, higher volume, and/or larger institutional applications;
- continued increase in the number and use of computerized online information services and online information gateways (that provide the channels for information exchange), and continued advances in the underlying computer and telecommunication technologies;
- rapid advances in optical disk technologies and applications, including accelerating penetration of CD-ROM (compact disk read-only memory), maturation of WORM (write once read many times) and erasable optical disks, plus emergence of CD-I (compact disk interactive, with audio, video, graphics, textual, and software capabilities all on one disk); and
- rapid advances in the development of expert systems applicable to many aspects of information dissemination—including technical writing, indexing, information retrieval, and printing management.

Many individual Federal agencies already are experimenting with and increasingly implementing information dissemination via electronic bulletin boards, floppy disks, compact optical disks, desktop publishing, and electronic printing-on-demand. For example, statistical data are highly suited to electronic formats, and, based on the results of the General Accounting Office (GAO) survey of Federal agencies (see box B), about one-third of the civilian departmental agencies use magnetic tape or disks, one-fifth floppy disks and electronic data transfer, and one-tenth electronic mail for dissemination of statistical data (see Table 1-1). By comparison, about three-fourths of the agencies use paper and roughly one-tenth use microfiche for disseminating statistical data. Overall, civilian agencies (departmental and independent) reported over 7,500 information products disseminated electronically, as of fiscal year 1987. The number of civilian agency publications in paper format appears to be declining slowly, while the number of electronic products has more than tripled over the past 4 years. The GAO survey results suggest that this trend will continue. For example, by 1990, agency use of electronic mail and bulletin boards, floppy disks, and compact optical disks in disseminating scientific and technical information is expected to more than double, on the average, as shown in Table 1-2.

With respect to demand for Federal information, OTA has concluded that, for the foreseeable future, paper will continue to be the preferred format for many purposes, such as browsing government reports, and microfiche will continue to be used for document storage and archival purposes. However, **OTA's 3- to 5-year outlook for the dissemination of Federal information indicates that overall demand for paper formats will decline modestly and the demand for microfiche will drop rather markedly, while the demand for electronic formats will increase dramatically.**

There already is a significant demand for Federal information in electronic formats among user groups, and particularly within the library

Box B.—General Accounting Office Surveys of Federal Agencies and Federal Information Users

GAO, at the request of the Joint Committee on Printing, conducted several surveys that provided important input to the OTA report. Copies of the complete results are available from GAO.

Federal agency survey. In 1987, GAO surveyed all 13 cabinet-level departments and 48 major independent agencies with respect to information dissemination practices, technologies, budgets, plans, and policies. GAO asked department or agency senior Information Resources Management officials to coordinate the response but to consult with agency printing officers, librarians, publishers, and public information officers, among others. GAO asked that the cabinet departments provide a separate response for each major subdivision or component, such as bureaus or administrations. GAO received responses from 114 civilian departmental components, 11 Department of Defense components, and 48 independent agencies. GAO edited responses for completeness and internal consistency but did not independently verify their accuracy.

Overall, the survey results are very informative; however, the survey responses were unaudited and undocumented. Also, it is unclear how the agency responses were developed, especially with respect to evaluative questions. Nonetheless, the results present a useful overall picture of agency information dissemination activities.

Federal information user surveys. In 1987-1988, GAO surveyed four user groups: (1) GPO depository libraries; (2) other libraries; (3) scientific and technical associations; and (4) general associations. These groups were surveyed with respect to current and desired types and formats of Federal information.

As with the Federal agency survey, the results of the user surveys were not verified, and the exact process by which the responses were provided is not known. Also, the sampling error could be high, but it does not affect the OTA analysis since OTA has emphasized only the major trends and findings that emerged from these surveys.

Table 1-1.—Civilian Departmental Agency Dissemination of Statistical Information, by Format Used

Format used	Percent of agencies responding[a]
Paper	73
Magnetic tape/disk	32
Floppy disk	19
Electronic data transfer	18
Microfiche	12
Electronic mail	8
Microfilm	5
Electronic bulletin board	4
Videotape	2
Film	1

[a] Totals more than 100 percent since many agencies use more than one format.

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

community, private industry, Federal agencies themselves, and various groups with specialized needs (such as educators, researchers, and disabled persons). OTA projects that this demand will rise sharply over the next few years, especially among the more technically sophisticated user groups.

Table 1-2.—Civilian Departmental Agency Dissemination of Scientific and Technical Information, by Format Used, Current and Projected

	Percent of agencies responding		
Format	Use now (1987)	Use in next 3 years[a] (by 1990)	Percent change
Electronic mail	6.1	15.8	+159
Electronic bulletin board	6.1	10.5	+72
Electronic data transfer	14.9	18.4	+24
Magnetic tape/disk	14.0	16.7	+19
Floppy disk	8.8	16.7	+90
Compact optical disk	—	8.8	+

[a] Calculated by adding the percentage of agencies now (as of 1987) using the format indicated to the number who expect to use the format within the next 3 years (by 1990). Assumes that agencies currently using a format will continue to do so.

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

Photo credit: U.S. Government Printing Office

GPO computer room

The results of the GAO survey of Federal information users document this likely trend in demand. For example, the depository library community (as intermediaries reflecting users and user information needs in university, research, Federal, State, local, and public libraries) indicated a strong preference for obtaining increasing percentages of Federal information in electronic form and declining percentages in paper and microfiche. The survey results for 318 depository libraries out of a sample of 451 (34 of the 51 regional depositories and 284 of the 400 selective depository libraries sampled) are highlighted in Table 1-3. These results show that, by and large, the depository library community desires or anticipates decreases in use of paper and microfiche formats and significant increases in online databases and compact optical disks. Trends for other surveyed segments of the Federal information user community (e.g., nondepository libraries, scientific and technical associations) are not so dramatic, but show a similar pattern.

Electronic publishing and related technologies, when coupled with essential technical

Table 1-3.—Depository Library Demand for Federal Information, by Type and Format

		Number of libraries responding		
Type of information	Format	Demand now	Demand in next 3 years	Percent change
Congressional Record/hearings/ reports/ bills	paper	271	234	−14
	microfiche	274	225	−18
	online database	59	132	+124
	floppy disk	0	27	+
	compact optical disk	3	112	+3600
Scientific and technical reports/ information	paper	244	172	−17
	microfiche	212	159	−22
	online database	76	95	+25
	floppy disk	1	27	+2600
	compact optical disk	9	78	+770
Press releases/bulletins	paper	246	183	−26
	microfiche	39	35	−10
	electronic mail or bulletin board	9	51	+467
	online database	24	50	+108
	compact optical disk	1	18	+1700
Statistical data	paper	309	270	−13
	microfiche	241	134	−44
	electronic mail or bulletin board	12	27	+125
	online database	103	158	+53
	magnetic tape/disk	11	25	+127
	floppy disk	12	65	+442
	videodisk	0	12	+
	compact optical disk	15	140	+833

SOURCE: General Accounting Office Survey of Federal Information Users, 1988.

standards, offer the near-term prospect for integrated information systems utilizing the "information life cycle" concept. Here, the collection, processing, storage, and dissemination (and ultimately retention or archiving) of information in multiple formats (paper, microform, and electronic) are viewed and implemented as interrelated functions rather than separate, unrelated activities. The life cycle concept offers the prospect of improvements in Federal productivity or cost avoidance through increased efficiencies in the publishing of government reports, reduced paper and postage costs, and the like (see box C).

The Federal Government should be able to realize at least a significant portion of the productivity improvements demonstrated by private business users. Private firms typically report 30 to 50 percent productivity improvement with a payback on investment in the 2- to 3-year range. The Federal Government spends, conservatively, $6 billion per year on information dissemination (not including the cost of collection, processing, or a prorated share of agency automation). Thus, **productivity improvements on the order of hundreds of millions of dollars per year appear to be readily achievable.** In addition, the substantial ongoing investment by Federal mission agencies in agency automation, if planned and implemented properly, can incorporate multi-format information dissemination at little additional marginal cost, compared to the total cost of automation, and with the potential for net cost savings in agency information functions.

PROBLEMS AND CHALLENGES

Technological advances are creating a number of problems and challenges with respect to Federal information dissemination:

- At a fundamental level, **electronic technology is changing or even eliminating many distinctions** between reports, publications, databases, records, and the like, in ways not anticipated by existing statutes and policies. A rapidly growing percentage of Federal information exists at some point in an electronic form on a computerized system as part of "seamless web" of information activities.
- **Electronic technology permits information dissemination on a decentralized basis** that is cost-effective at low levels of demand, but in ways that may challenge traditional roles, responsibilities, and policies. In contrast, conventional ink-on-paper printing technology tends to be cost-effective with more centralized production and distribution and higher levels of demand.
- **Electronic technology is eroding the institutional roles of governmentwide information dissemination agencies.** While many Federal agencies disseminate at least some of their information in electronic formats, the central governmentwide dissemination mechanisms (SupDocs, DLP, NTIS, and CIC) are presently limited largely to paper or paper and microfiche formats and thus disseminate a declining portion of Federal information.
- **Technology has outpaced the major governmentwide statutes** that apply to Federal information dissemination. The Printing Act of 1895, Depository Library Act of 1962, and Freedom of Information Act of 1966 predate the era of electronic dissemination, and have not been updated to explicitly reflect electronic as well as paper formats. The Paperwork Reduction Act of 1980 was amended in 1986 to include information dissemination within its scope, but substantive statutory guidance on electronic information dissemination per se is minimal.
- **The advent of electronic dissemination raises new equity concerns** since, to the extent electronic formats have distinct ad-

Box C.—Some Opportunities for Productivity Improvement or Cost Avoidance Through Electronic Technology

- Electronic publishing
  - —facilitates the document revision process by minimizing rekeyboarding and graphics redesign;
  - —produces documents that are generally found to be more attractive and easier to read;
  - —reduces the total publishing time typically by 25 to 50 percent;
  - —reduces the total number of document pages typically by 35 to 50 percent, since typeset pages contain more text than typewritten pages;
  - —reduces the costs for paper and postage for hard copy print runs; and
  - —can achieve rates of return on investment of up to 30 to 50 percent and payback periods of 2 to 3 years or less.
- Compact disk-read only memory (CD-ROM)
  - —can store and disseminate large amounts of information at very low cost;
  - —is best suited for statistical, reference, technical, and other information that does not require frequent updates;
  - —can store up to the equivalent of about 250,000 pages of typewritten, double-spaced text on one disk, or the equivalent of about 1,500 single-sided floppy disks or about 10 of the 1,600 bits-per-inch magnetic computer tapes;
  - —can reduce the cost of dissemination by an order of magnitude compared to magnetic tapes and up to two orders of magnitude compared to paper documents (a typical estimate is that the same amount of information that could be disseminated for $50 per week on CD-ROM would cost $345 per week on magnetic tapes and $2,250 per week in paper); and
  - —permits searching, retrieval, and manipulation of the data in ways simply not possible with paper (or microfiche) formats.

SOURCE: Office of Technology Assessment, 1988.

vantages (e.g., in terms of timeliness, searchability), those without electronic access are disadvantaged. In general, the library, research, media, public interest, consumer, and State/local government communities, among others, argue that the Federal Government has a responsibility to assure equity of access to Federal information in electronic formats as well as in paper. These groups contend that they are or will increasingly be disadvantaged to the extent that Federal information in electronic form is not available through normal channels.

- **Technological advances complicate the Federal Government's relationships with the commercial information industry.** While those companies that market repackaged or enhanced Federal information benefit from access to electronic formats, some of these firms are concerned about possible adverse effects of government competition. Efforts by the Office of Management and Budget (OMB) to establish policy in this area have proven to be controversial. Also, the privatization of major Federal information dissemination activities (such as the NTIS clearinghouse) has not yet been demonstrated to be either cost-effective or beneficial for important governmental functions.
- **OMB and industry representatives support government dissemination of Federal information in raw electronic form without software enhancements or searching aids, but oppose government dissemination of enhanced or "value-added" information.** This conflicts with the long-established government role in producing and disseminating value-added information products in paper format and its logical extension to electronic formats. Existing policy does not define "value-added" or specify under what conditions value-added electronic information products are inherently or appropriately governmental versus commercial in nature.
- In general **information industry represent-**

atives strongly favor open government and unimpeded and nondiscriminatory access to Federal information for philosophical and competitive fairness reasons (i.e., so that no single vendor has a captive or monopoly position over Federal information). In these respects, the industry shares common ground with the library, research, and press communities, among others.

The absence of congressional action to address these issues is likely to result in:

- continuing erosion in overall equity of public access to Federal information,
- continuing confusion over institutional roles and responsibilities,
- a significant time and dollar cost to the government and various stakeholders in seemingly endless debate over statutory interpretation and legislative intent,
- inefficiency and excessive duplication in electronic information dissemination research and pilot-testing,
- inability to capture learning from experience and economies of scale, and
- failure to realize the significant opportunities for cost-effective improvements in overall public access to Federal information.

OTA concluded that the government needs to set in motion a comprehensive planning process for creatively exploring the long-term future (e.g., 10 to 20 years from now) when the information infrastructure of the public and private sectors could be quite different. At the same time, the government needs to provide short-term direction to existing agencies and institutions with respect to electronic information dissemination. A central challenge is setting future directions for the governmentwide information dissemination institutions.

Any electronic future for GPO, NTIS, and DLP must consider the increasingly decentralized, competitive environment that characterizes the electronic information marketplace. The Federal Government is moving in the direction of implementing electronic information systems at the heart of most agency activities. In the long-term, the myriad of possible information dissemination alternatives, made possible by technological advances, could serve as a catalyst for significant changes in the current institutional framework. Full understanding of long-term alternatives will require several years of pilot tests, demonstrations, and experiments and related evaluation studies. In the short- to medium-term (3 to 10 years), the basis for setting directions is better established.

> . . . an intelligent, informed populace has been, is, and will continue to be the fundamental element in the strength of our Nation. Contributing greatly to that intellectual strength is the so-called Government document, designed to disseminate to the American public important information relative to the activities and purposes of its Government.
>
> *—former U.S. Senator Frank J. Lausche, March 1962*

GOVERNMENT PRINTING OFFICE

GPO has historically carried out most of the Federal Government's ink-on-paper printing, either directly or through private contractors, has marketed and sold selected government documents (in paper and microfiche) to the public (through the SupDocs), and has distributed government documents to the depository libraries (through the DLP). While GPO already makes extensive use of electronic input and photocomposition, there is very little production or sales of products in electronic formats. GPO does sell (through SupDocs) some agency and congressional products in magnetic computer tape format. It also has ongoing pilot projects involving both online and CD-ROM dissemination and both desktop and high-end electronic publishing, pursuant to direction of the Joint Committee on Printing (JCP).

Defining GPO's future role in the dissemination of electronic formats presents a major opportunity for Congress and GPO. One alternative, mandatory centralization of all electronic dissemination through SupDocs (or any other central government office), would conflict with numerous existing agency activities, would meet strong agency opposition, could precipitate legal and political challenges, and would not appear to be cost-effective. On the other hand, excluding electronic formats from the SupDocs sales program would erode the viability and integrity of the program over time, and compromise the ability of SupDocs to facilitate broad public awareness and use of Federal information. **A middle ground alternative, with SupDocs including selected electronic formats and products, would appear to strengthen the SupDocs sales program, facilitate public access, and preserve the prerogatives of the agencies to disseminate electronically themselves (and of private vendors to enhance and resell electronic formats).**

Photo credit: U.S. Government Printing Office

GPO operator using electronic photocomposition equipment

SupDocs sales of magnetic computer tapes, floppy disks, compact optical disks, and perhaps electronic printing-on-demand products would appear to be straightforward, except for a possible overlap with NTIS. Sales of online services could be more difficult due to staffing, software development, and capital requirements, and to more intensive competition with agencies and commercial vendors.

Another challenge is to define GPO's role relative to the growth in agency desktop and high-end electronic publishing systems. The GAO survey of 114 civilian agency components indicated that one-half or more are currently operating or pilot testing desktop publishing, computer-aided page makeup, and electronic composition technologies, and one-third are operating or testing full electronic publishing systems, as shown in Table 1-4. OTA estimates that, as of fiscal year 1987, agencies had already spent at least $400 million on electronic publishing-related technologies.

GPO could have a key role in standards-setting, training, and innovative activities relevant to electronic publishing, but GPO will be operating in a much more decentralized, competitive environment than has traditionally been the case with conventional ink-on-paper printing. The general demand for conventional printing is likely to continue for several years at a slow growth or steady-state level. However, in the medium-term (3 to 10 years), a sig-

Table 1-4.—Civilian Departmental Agency Use of Selected Electronic Publishing-Related Technologies

	Percent of agencies responding		
Technology	Currently in operational use	Currently prototyping or pilot testing	Totals
Computer-aided page makeup	50.0	8.8	58.8
Computer graphics	65.8	7.9	73.7
Electronic photocomposition	43.9	7.9	51.8
Laser and other nonimpact printing	64.0	1.8	65.8
Desktop publishing system	34.2	14.9	49.1
Electronic publishing system	21.1	10.5	31.6

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

nificant portion of GPO inplant and procured printing could be suitable for electronic dissemination or vulnerable to competition from electronic formats. The plans and activities of defense agencies are particularly important, since the Army, Navy, and Air Force together account for roughly one-third of total GPO billings. Over the next few years, the defense agencies are hoping to place most manuals, directives, and technical documentation on electronic media. **GPO will have to be innovative in matching its expertise to agency needs, which are likely to vary widely and change at an increasingly rapid pace.**

With respect to GPO's role in traditional ink-on-paper printing, the fiscal year 1987 GPO printing workload totaled $771 million, of which about three-quarters was procured from commercial printing contractors and one-quarter carried out at the GPO main and regional printing plants. As shown in Table 1-5, about 80 percent of legislative branch printing work is done inplant, while about 85 percent of executive branch printing work is contracted out. Overall, about 45 percent of inplant work is legislative, while about 95 percent of contracted work is for the executive branch.

OTA examined several alternatives, including decentralizing GPO's conventional printing and procurement functions, transferring GPO's procurement program to the executive branch, and limiting GPO to legislative branch work. Based on information available to OTA (including comparative costs of GPO inhouse, GPO procured, agency inhouse, and agency procured printing), none of these alternatives appears to be cost-effective. These alternatives would largely eliminate concerns about separation of powers, since executive branch printing would no longer be done by or through a legislative branch agency. However, they could complicate the functioning of SupDocs and the DLP, and could have significant adverse effects on the GPO labor force.

OTA identified several opportunities for improvement in GPO's traditional printing services. These include more competitive pricing and timely delivery of GPO main plant inhouse work for executive agencies, itemized estimating and billing practices, regular surveys of customer needs and problems, and revised and strengthened GPO advisory groups.

In principle, the GPO main plant is well positioned to meet demands for conventional printing, with one of the best equipped printing facilities in the United States and an experienced work force. However, GPO inhouse printing costs are high in part due to the need to maintain operational capacity to handle a wide diversity of printing work, and to meet peak congressional and priority executive branch workloads. A significant part of this workload is well suited for electronic formats (e.g., *Congressional Record*, *Federal Register)*. A gradual transition from paper to electronic formats for these items could help reduce GPO costs, potentially increase access to this information, and place the GPO main plant on a more competitive footing for executive branch printing.

Table 1-5.—GPO Workload Distribution, Fiscal Year 1987 (in millions of dollars)

	Procured printing	Main plant printing	Regional plant printing	Totals
Legislative branch	$ 23	$ 90	NA	$113
Executive branch	552	90	$14	656
Judicial branch	1	1	NA	2
Totals	$576	$181	$14	$771

NA = not applicable.

SOURCE: U.S. Government Printing Office, 1987

NATIONAL TECHNICAL INFORMATION SERVICE

NTIS has historically served as the Federal Government's archive and clearinghouse for scientific and technical reports prepared by Federal agencies or contractors, along with related indices and bibliographies. The bulk of NTIS documents are provided in paper or microfiche format, although, in recent years, NTIS also has served as a clearinghouse for some electronic format products (e.g., software and databases). Also, NTIS performs other related services such as patent licensing, Japanese literature exchange, and FOIA request and/or information sales processing for a few agencies.

With respect to NTIS, the major opportunity is, quite simply, determining the future of NTIS as a government entity. NTIS faces strategic challenges on several fronts. First, the core NTIS business, as measured by sales of paper and microfiche reports, has been shrinking (by about 40 to 50 percent) over the past decade (see Table 1-6). In part as a result, NTIS prices for these reports have gone up considerably faster than the inflation rate in order to help maintain break-even operations. Over the last few years, NTIS has offset declining revenues from full-text reports and subscription, bibliographic, and announcement products with increasing revenues from services to other agencies (such as order billing and processing), brokerage fees on sales of other agency materials, and sales of computer-related products.

Photo credit: National Technical Information Service

NTIS staff pulls an archive document from the NTIS collection

Second, a significant percentage (estimated at one-third to one-half, see Table 1-7) of Federal scientific and technical reports are never provided to NTIS, since agency participation is strictly voluntary. The NTIS collection is thus becoming increasingly incomplete. Third,

Table 1-7.—Trend in New Titles Received by NTIS, Fiscal Years 1983, 1987

	1983	1987	Net change
Number of titles received	79,471	62,856	−21%
Estimated percentage of all relevant titles[a]	67%	53%	−14%

[a] Assumes the number of relevant agency titles remains constant at 119,000 per year.

SOURCE: National Technical Information Service and Office of Technology Assessment, 1988.

Table 1-6.—Trends in Sales of Selected NTIS Products, Fiscal Years 1980, 1987

	1980	1987	Net change
	in thousands of copies		
Paper documents	752	393	−48%
Microfiche documents	155	67	−57
	in millions of copies		
Selected Research in Microfiche (SRIM)	2.72	1.33	−51
	in thousands of subscriptions		
Government Research Announcements and Index	2.22	1.15	−48
Abstract Newsletters	16.0	6.8	−58

SOURCE: National Technical Information Service, 1988.

NTIS is being outdistanced by most of the Federal science agencies with respect to use of electronic information technology. And fourth, NTIS has been caught in the middle of the ongoing debate over privatization of Federal information functions. Since Congress has affirmed its intent that NTIS remain in the government, Congress now has the opportunity to determine where NTIS should be located and how it should relate to other Federal agencies, including what agency materials should or must be submitted to NTIS.

NATIONAL TECHNICAL INFORMATION SERVICE/ SUPERINTENDENT OF DOCUMENTS

Proposals have been made to retain NTIS in the Department of Commerce, as a government corporation or in essentially its present form; consolidate NTIS with SupDocs, either within GPO or as part of a newly established Government Information Office; and consolidate NTIS with the Library of Congress.

Whatever the alternative chosen by Congress, strengthened NTIS-SupDocs cooperation would likely lead to improvements in indexing, marketing, and international exchange of Federal information. And strengthened cooperation seems essential to the extent both agencies pursue sales of electronic format products and that SupDocs enters the low-demand market. At present, demand for NTIS documents averages about 10 copies per title, compared to about 2,000 copies per title for items in the SupDocs sales program (see box D for a comparison of NTIS and SupDocs).

NTIS and SupDocs could cooperate on implementing electronic technologies that would meet NTIS clearinghouse and archival needs, plus support a broadening of the SupDocs product line to include selected low-demand items. **Wherever located, NTIS appears to be ideally suited for implementation of an electronic document system (using optical disk storage, electronic printing, and multi-format output—paper, microfiche, and electronic), perhaps using the Defense Technical Information Center (DTIC) system as a prototype, that could revitalize NTIS if coupled with improved agency participation.** Overall, an electronic NTIS should be able to greatly increase the diversity and timeliness of NTIS (and related private vendor) offerings, increase the ability of NTIS (and private vendors) to match information products with potential users, and reduce costs.

> . . . the new [electronic] technology not only gives potential users quicker and more convenient access to wider bodies of information, including instantly current information, than can be provided by print alone; it also gives the user a new kind of ability to search through and manipulate the information, and in effect to create new information by the selection, combination, and arrangement of data.
>
> —*Commission on Freedom and Equality of Access to Information, American Library Association, 1986.*

DEPOSITORY LIBRARIES

The DLP is administered by GPO and serves as a mechanism for dissemination of Federal agency documents free of charge to the approximately 1,400 participating libraries. The libraries, in return, provide housing for the documents and access to this information free of charge to the general public. About 55 percent of the depository libraries are university libraries, 23 percent are public libraries, 11 percent are law school libraries, 7 percent are Federal libraries, and 4 percent are special libraries and the like.

Box D.—National Technical Information Service and Superintendent of Documents, How They Compare

	NTIS	SupDocs
Branch of government	Executive	Legislative
Location	Department of Commerce	GPO
Statutory authority	15 U.S.C. 1151-1157	44 U.S.C 1701-1722
Total annual revenues[a] (approximate)	$22 million	$100 million
Titles for sale (approximate)	2 million	20,000
Total annual sales volume[b]	6 million copies	27 million copies
Average sales per title	10 copies	2,000 copies
Primary document formats	paper, microfiche	paper, microfiche
Primary source of documents	Federal agencies and contractors	Federal agencies, Congress
Electronic products[c] (approximate)	800 numerical or statistical databases 300 textual databases 300 computer software items (incl. models)	few dozen magnetic tape products
Prepares bibliographies/ catalogs	Yes	Yes
Conducts marketing activities	Yes	Yes
Carries out international document exchange	Yes	Yes
Performs reimbursable services	Yes—for agencies	Yes—Consumer Information Information Center, Depository Library Program[d]

[a] Includes fiscal year 1987 revenues from reimbursable services and services funded through appropriations.
[b] Fiscal year 1987; SupDocs data include Consumer Information Center sales.
[c] Fiscal year 1987.
[d] Reimbursed through appropriations.

SOURCE: National Technical Information Service and U.S. Government Printing Office, 1988.

As with GPO and NTIS, there is a major opportunity to define the future role of the DLP with respect to dissemination of Federal information in electronic formats. **As agencies make increasing use of electronic formats, limiting the DLP to paper and microfiche products would, over time, reduce the type and amount of Federal information available to the public, and would erode the legislative intent of the DLP** (e.g., as expressed in the legislative history of the Depository Library Act of 1962). The impetus for including electronic information in the DLP is strong. The JCP has interpreted the DLP statutory provisions as extending to government information in all formats, and other congressional committees concur in the decision to disseminate certain electronic formats to depositories. OTA concluded that, if it is to succeed, this emerging policy needs to be further developed and refined, and have the support of DLP participants (especially libraries, GPO, and the agencies that are the source of most DLP materials). A variety of pilot projects, demonstrations, and tests involving various technologies, financial arrangements, and delivery mechanisms (including possible involvement of the private sector) is warranted. Ultimately, Congress may wish to

Documents/Science
Reference Service

Photo credit: Documents Center, Robert W. Woodruff Library, Emory University

Librarian assisting user at reference desk at the Robert W. Woodruff Library

consider a reorganization or restructuring of the current DLP in light of both electronic information dissemination options now or likely to become available and the evolving nature of libraries and the telecommunication infrastructure.

An important reason for electronic pilot projects is to better understand the issue of costs to users, government, and depository institutions. **If the basic underlying principle of the depository program is to retain free access to government information for users, then Congress needs to be aware that there may be additional costs associated with the introduction of certain electronic services, and assist depository libraries and GPO in designing and financing ways to make this information available to the public.**

Distribution of selected government information products in CD-ROM format such as the bound, cumulated *Congressional Record* could improve access to such information and could be a cost-effective dissemination mechanism for certain datafiles. There could be some additional equipment and training costs associated with this format for the depository library participants. Delivery of online datafiles (such as the *Federal Register*) to the public through depository institutions requires pilot-testing to determine how best to provide access to this information, and how to ensure that the additional costs associated with online formats do not hinder public access or place unrealistic, unmanageable financial or administrative burdens on participating libraries.

The results of the GAO survey of Federal information users indicate a substantial depository library demand for electronic formats. The vast majority of libraries responding indicated that the *Record* and *Register*, along with an index to Federal information and database of key Federal statistical series, would be moderately to greatly useful in both online and CD-ROM formats, as shown in Table 1-8. The GAO survey also found that many of the depository libraries have access to key information technologies, as shown in Table 1-9.

Table 1-8.—Depository Library Demand for Federal Information in Electronic Formats

	Percent of libraries responding moderately to greatly useful[a]	
Item	Online immediate access	Offline CD-ROM issued monthly
Congressional Record	77	74
Congressional Committee Calendar/Bill Status	70	60
Federal Register	86	80
Federal Agency Press Releases	46	40
Agency Reports	61	62
Comprehensive Index to Federal Information	94	90
Integrated Database of Key Federal Statistical Series	90	88

[a] Based on responses from 318 depository libraries out of a sample of 451

SOURCE: General Accounting Office Survey of Federal Information Users, 1988

Table 1-9.—Depository Library Access to Information Technology

Information technology	Number of libraries with access[a]
Microcomputer without modem	283
Microcomputer with modem for online access	337
Microfiche reader without printer	352
Microfiche reader with printer	384
CD-ROM reader	169
Videodisk player	72
Mainframe computer	149

[a] Based on responses from 403 depository libraries out of a sample of 451 depository libraries.

SOURCE: General Accounting Office Survey of Federal Information Users, 1988.

TECHNICAL/MANAGEMENT IMPROVEMENTS

OTA identified several important technical/management alternatives that could be implemented under a wide range of institutional scenarios and could be implemented by agency action using existing statutory authorities and with congressional concurrence. These alternatives include:

- **Technical standards** on text markup, page/document description, optical disks, and other areas important to information dissemination (see box E). The National Bureau of Standards (NBS), DTIC (or another responsible Department of Defense component), and GPO could be assigned lead responsibility, presumably building on accepted or emerging private sector industry standards to the extent possible and working through the existing national and international standards organizations.
- **Governmentwide information index** to major Federal information products, regardless of format. GPO and/or NTIS could be assigned lead responsibility to consolidate and upgrade existing indices, directories, and inventories into one integrated index. The government could contract with private firms or library and information science professionals to carry out some of this work. The index could be made available in multiple formats and disseminated both directly from the government as well as via the depository libraries and private vendors (perhaps in enhanced form).
- **Innovation centers** to exchange learning and experience about technological innovations and user needs relevant to information dissemination. Such centers could be designated or established at, for example, DTIC (for the defense sector), NBS and NTIS (for the civilian executive branch), and GPO (for the legislative branch). DTIC, NBS, and GPO, along with several mission agencies, already have a variety of laboratory and/or demonstration activities under way. Agencies could be required to conduct "Agency X-2000" studies to creatively explore and develop their own visions of future information dissemination activities.
- **Revised Information Resources Management (IRM)** program. A variety of training, career development, budget reporting, and management actions could be taken to give information dissemination (including printing, publishing, public affairs, press, library, and related activities and personnel) a stronger and better understood role within the IRM concept.
- **Electronic press release service.** Press releases and other time-sensitive information (such as crop reports, weather bulletins, and economic and trade data) from major Federal agencies could be electronically provided directly to the press, via

Box E.—The Importance of Text Markup and Page Description Standards for Information Dissemination

Text markup standards are particularly important to realize the full benefits of electronic information dissemination. If government documents (whether reports, pamphlets, manuals, other text, or text plus tabular and graphics material) are not prepared in a standardized electronic format using standardized codes and descriptors, substantial and costly recoding and rekeyboarding may be necessary at later stages of the dissemination process. Text markup standards are intended to establish a consistent set of codes for labeling key elements of a document—such as chapter titles, paragraph indentations, tabular presentations, and the like. If these electronic codes are widely agreed upon and used (i.e., standardized), then the documents can be electronically transferred from one stage in the dissemination process to another with little or no additional effort and cost, if the equipment is designed to be compatible with the electronic codes. Three major approaches to text markup standards are:

- GPO's logically structured full text database standard;
- Standard Generalized Markup Language (SGML), an international standard that has been adopted by DoD and NBS; and
- Office Document Architecture (ODA), an international standard under consideration by NBS.

Page description standards are also very important. If the language or code used by the page composition equipment is not compatible with the code used by the output devices (e.g., printers), then additional work is required to convert the codes. Sometimes it is easier just to rekeyboard and recode the entire document, at significant additional cost. Page description languages are intended to establish a consistent set of codes compatible with both composition and output equipment. One possible page description standard is PostScript, a defacto industry standard under consideration by NBS and the national and international standards organizations. Another possibility is the Standard Page Description Language (SPDL) now being developed.

SOURCE: National Bureau of Standards, Defense Technical Information Center, and U.S. Government Printing Office, 1988.

private electronic news and wire services, and to the DLP. A major issue concerns equity of press access and the need to ensure that cost or technical requirements do not discourage smaller, less affluent, and/or out-of-town news organizations from realizing the potential benefits. While electronic press releases can be more timely and cost-effective than messenger or mail delivery of paper releases, dual format (paper and electronic) would appear to be necessary—at least for a lengthy transition period—for those news outlets without, or lacking interest in, online electronic capability.

Photo credit: USA TODAY, Gannett, Co., Inc. all rights reserved

Reporter sitting at video display terminal

STATUTORY/OVERSIGHT CHANGES

Congress could amend the Printing Act, Depository Library Act, and Paperwork Reduction Act to provide statutory direction for specific institutional and technical/management alternatives, as well as to provide general philosophical guidance on electronic information dissemination.

At the most basic level, a fundamental cross-cutting issue is public access to Federal information. Debate over the use of electronic formats, privatization, and the like is obscuring the commitment of Congress, as expressed in numerous public laws, to the importance of Federal information and its dissemination in carrying out agency missions, and the principles of democracy and open government. A renewed congressional commitment to public access in an electronic age may be needed.

Congress may wish to legislate a governmentwide electronic information dissemination policy. In so doing, Congress would need to consider several sometimes competing considerations, including: enhancing public access; minimizing unnecessary overlap and duplication in Federal information activities; optimizing the use of electronic versus paper formats; and optimizing the role of the private sector. OMB has promulgated its own view, albeit controversial, of appropriate public policy (in the form of OMB Circular A-130). The vast majority of agencies do not have policies on electronic dissemination (see Table 1-10). As agencies begin to develop such policies, the OMB view is likely to have a dominant role, in the absence of clear and positive congressional guidance. **Congress may wish to amend specific statutes or otherwise promulgate its own views on the basic principles addressed and policies enunciated in OMB Circular A-130 as it relates to Federal information dissemination.** In particular, Congress could provide more specific guidance on the role of the private sector and contracting out of Federal information dissemination, user charges, and provision of value-added information products. Congress could also make any necessary adjustments in oversight mechanisms (such as establishing a Joint Congressional Committee on Government Information).

With respect to the Freedom of Information Act (FOIA), this statute too was enacted in an era when paper records were the dominant form of government information. The application of FOIA to electronic formats has created a number of problems. The courts have expressed a need for Congress to clarify gray areas left open by the statute. For example:

- The case law as applied to paper information establishes that FOIA does not require agencies to create new records in

Table 1-10.—Federal Agency Policies on Electronic Information Dissemination

	Percent of agencies having documented policies	
Policies and procedures for	Dept.[a]	Ind.[b]
Public access to agency electronic databases?		
yes	9.6	10.4
no	90.4	89.6
Electronic dissemination by agency contractors?		
yes	7.9	6.3
no	43.0	41.7
do not use contractors	49.1	52.1
Applicability of FOIA to electronic formats?		
yes	18.4	25.0
no	81.6	75.0

[a] Percent of 114 departmental civilian agency components responding.

[b] Percent of 48 independent civilian agency components responding.

SOURCE: General Accounting Office Survey of Federal Agencies, 1987.

fulfilling requests. When additional programming is required to extract information from computer systems, agencies and courts have sometimes held that such programming would be analogous to record creation, and therefore would not be a required part of the FOIA "search" process. In the electronic age, however, some degree of reprogramming or program modification may be essential to obtain access to electronic information.

- Another gray area involves defining a "reasonable effort" on the part of the government in searching for records responsive to a FOIA request. In the computer context, the programming/no programming distinction has begun to separate decisions about "reasonableness" from considerations of effort. This is incongruous with tradition, as significant expenditures of effort continue to be involved in manual FOIA searches. Retrieval of paper documents may involve extensive tracking, communication with various bureaus, consolidation of disparate files, and substantial hand deletions of exempted materials. As computer capabilities for searching, segregating, and consolidating of data become increasingly efficient and cost-effective, computer searches could be broadened and public access enhanced. Agencies may need to focus on designing new ways to respond more readily to FOIA requests for computer records.
- Another issue is whether and under what conditions the advantages of electronic formats are such that access to the format as well as the information itself should be guaranteed. Although the case law and the FOIA fee guidelines have established that computer-stored information is subject to FOIA, requesters are not guaranteed access to the information in formats other than paper. If large quantities of data could be more effectively utilized with the flexibility offered by magnetic tapes, disks, or online retrieval, access to these electronic media may be important.

Congress could amend FOIA to bring electronic formats clearly within the statutory purview, define the scope and limits of FOIA searches in an electronic environment, and clarify fees and procedures for FOIA requests for electronic information. For the 1990s and beyond, Congress may need to decide whether the FOIA should continue to be viewed as an "access to records" statute, or whether it should be perceived more broadly as an "access to information" statute. Due to the explosive growth in electronic information storage, processing, and transmission by the Federal Government, traditional views about records and searches may need to be modified to ensure even basic access to computerized public information.

LEGISLATIVE BRANCH

Congress itself is a major source of Federal information. Congressional information ranges from the *Congressional Record* to congressional calendars and schedules to the status of pending legislation to a wide range of committee reports, and to numerous documents produced by the analytical support agencies (Congressional Research Service [CRS], General Accounting Office [GAO], and Congressional Budget Office [CBO], as well as OTA). Most of this information has been and continues to be available in paper formats. However, increasingly, electronic formats offer significant advantages in terms of timeliness and searchability, and are being utilized by private vendors and congressional in-house support offices (e.g., the House Information Systems Office and CRS) for a growing range of congressional information.

To a large degree, OTA's general findings about technological trends and opportunities also apply to congressional information. Electronic options offer the potential to make congressional information more quickly and widely available. This can be very important for citizens and organizations—whether consumer, library, research, labor, or business in nature—that desire to closely follow congressional activity and/or participate in the legislative process. As congressional offices automate, increasing amounts of information are created, revised, and stored in electronic form. This creates the potential to apply "information life cycle" and "multi-format output" concepts to the legislative branch as well as to the executive branch. Again, common technical standards will be important in realizing this potential.

Congress has the opportunity to establish a strategic direction for electronic dissemination of legislative branch information. The importance of congressional information to an informed citizenry and the need to ensure equitable channels of access for all interested citizens, including access to electronic formats, are widely accepted in principle. The differences of opinion focus on the means of implementation.

In setting an overall direction, Congress will need to determine its own level of responsibility for ensuring that electronic congressional information is readily available to the public, and how that information should be made available (by GPO, other congressional offices, and private vendors). For example, because of GPO's growing role in providing electronic formats to Congress as part of the electronic publishing process, GPO is positioned to more actively participate in disseminating electronic congressional information to the GPO depository libraries and the public-at-large. At the same time, some commercial vendors would like to contract directly with Congress, perhaps on a bulk rate discount basis, for electronic dissemination of congressional information to libraries, the public, and Congress itself.

Finally, given the large number of House, Senate, and congressional support offices and units involved with the creation and dissemination of congressional information, Congress may wish to establish a formal coordinating mechanism to maximize the exchange of learning and minimize the potential overlap, and to take advantage of the opportunities for technologically enhanced access. In many respects, congressional decisions on electronic dissemination of congressional information are just as important as prior decisions on radio and television coverage of congressional hearings and floor sessions.

ABOUT THIS REPORT

The report is organized into 12 chapters. Chapter 1 is the summary. Chapters 2 and 3 together provide an overview of key technical and institutional trends and issues. Chapter 2 presents a picture of current evolving Federal Government information dissemination technologies and activities. The results of the GAO survey of Federal agencies are used extensively. Chapter 3 discusses current technical trends that are relevant to Federal information dissemination and that are expected to continue or intensify for 3 to 5 years into the future and in many cases longer.

Chapters 4, 5, 6, and 7 provide substantial analysis and discussion on the major governmentwide information dissemination institutions—GPO (including SupDocs), NTIS, and DLP. Chapter 4 examines three alternative futures for GPO printing functions—continuation of a traditional ink-on-paper printing role only, for both the legislative and executive branches; a GPO for the legislative branch only; and the so-called decentralized electronic GPO that would involve expanded electronic publishing activities and the inclusion of some electronic formats in the SupDocs sales program. The results of the GAO surveys of Federal information users are used extensively in chapter 4. These three alternatives highlight a range of considerations important to planning GPO's future.

Chapter 5 examines the opportunities and challenges facing NTIS. Some of the GAO user survey results are included, and survey results previously cited in chapters 2 and 4 are also relevant. Improved cooperation between NTIS and SupDocs is also examined. Much of the discussion is relevant to NTIS and SupDocs regardless of the institutional structure as long as NTIS remains in the government in some form.

Chapters 6 and 7 provide indepth analysis and discussion of the history and current status of GPO's Depository Library Program with respect to electronic dissemination. Chapter 6 covers a range of electronic information technologies currently used or whose use is contemplated by libraries, and introduces the DLP, current technology and several dissemination issues. Chapter 7 examines and evaluates in considerable depth a range of alternative futures for DLP with specific illustrations. Two case studies are presented on the *Congressional Record* and the *Federal Register*. Finally, chapter 7 provides an analysis of pending DLP policy and institutional issues regarding electronic dissemination.

The next three chapters—8 through 10—examine other important dimensions of Federal information dissemination. Chapter 8 discusses congressional information dissemination with particular attention to two case studies (on the *Congressional Record* and bill status information) and to the dissemination practices of three congressional support agencies (OTA, GAO, and CRS).

Chapter 9 presents an indepth analysis of FOIA with respect to electronic formats. This chapter reviews statutory and judicial precedents on the applicability of FOIA to electronic media, and examines possible directions for amending FOIA in light of the implications of technological change for basic FOIA concepts. Chapter 10 focuses on the electronic press release and its implications for government-press relationships. The chapter reviews the status of automation in Federal agency press offices and in the press newsroom, examines the strengths and weaknesses of electronic press releases, and discusses the technological and strategic choices.

Chapter 11 considers a wide range of policy and institutional issues that are relevant to Federal information dissemination. Chapter 11 also highlights the debate over the applicability and interpretation of key policy instruments to electronic dissemination. Chapter 12 discusses possible future directions for and broader implications of SupDocs and NTIS involvement in Federal electronic information dissemination.

Several crosscutting themes are relevant to many chapters. Three of the most important themes are:

1. public access to Federal information,
2. user needs for Federal information, and
3. the private sector role in Federal information dissemination.

While there are not separate chapters devoted to these topics, they are discussed throughout the report. Also, while there is a separate chapter on technology trends, technology is discussed to varying degrees in every chapter of the report. Similarly, while there are separate chapters on GPO, NTIS, and DLP, there is at least something significant in every chapter of the report that is relevant to planning the future of these institutions.

For discussion of related topics not covered in this report, see the other OTA reports listed below. These reports cover such topics as: the tension between public access to government information and: protection of national security interests; physical security and data integrity; privacy rights of individuals and organizations; and intellectual property rights. Other reports cover the need to preserve government information for archival and historical purposes, and the need to consider government information in the context of long-term social, political, and economic changes relevant to the information and communication infrastructure of the United States.

- *Medlars and Health Information Policy—A Technical Memorandum*, OTA-TM-H-11, September 1982. NTIS order #PB 83-168 658.

- *Federal Government Information Technology: Electronic Surveillance and Civil Liberties*, OTA-CIT-293, October 1985. GPO stock #052-003-01015-1; $3.00. NTIS order #PB 86-123 239/AS.
- *Federal Government Information Technology: Management, Security, and Congressional Oversight*, OTA-CIT-297, February 1986. GPO stock #052-003-01026-7; $7.50. NTIS order #PB 86-205 499/AS.
- *The Regulatory Environment of Science*, OTA-TM-SET-34, February 1986. GPO stock #052-003-01024-1; $6.00. NTIS order #PB 86-182 003/AS.
- *Intellectual Property Rights in an Age of Electronics and Information*, OTA-CIT-302, April 1982. GPO stock #052-003-01036-4; $15.00 NTIS order #PB 87-100 301/AS.
- *Federal Government Information Technology: Electronic Record Systems and Individual Privacy*, OTA-CIT-296, June 1986. GPO stock #052-003-01038-1; $7.50 NTIS order #PB 87-100 335/AS.
- *Commercial Newsgathering From Space*, OTA-TM-ISC-40, May 1987. GPO stock #052-003-01066-6; $3.00.
- *The Electronic Supervisor: New Technology, New Tensions*, OTA-CIT-333, September 1987. GPO stock #052-003-01082-8; $6.50.
- *Defending Secrets, Sharing Data: New Locks and Keys for Electronic Information*, OTA-CIT-310, October 1987. GPO stock #052-003-01083-6; $8.50.
- *Science, Technology, and the First Amendment*, OTA-CIT-369, January 1988. GPO stock #052-003-01090-9; $3.50.
- *Book Preservation Technologies*, OTA-O-376, May 1988. GPO stock #052-003-01103-4; $5.00.
- *Communication Systems for an Information Age*, OTA-CIT, forthcoming, spring 1989.
- *Scientific and Technical Information Dissemination: Opportunities and Problems*, forthcoming, spring 1989.

Chapter 2

Overview of Federal Information Dissemination

Photo credit: Chase Studios

National Institute of Health medical staff using the National Library of Medicine's Medline database

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Chapter 2

Overview of Federal Information Dissemination

SUMMARY

Information dissemination is a significant function of the Federal Government, accounting for an estimated $6 billion per year in annual expenditures for relevant executive agency activities (including information clearinghouse operations, printing and publishing, library operations, and related research, development, and testing). This estimate does not include expenditures for the collection and development of the information disseminated, or even a prorated portion of expenditures for basic agency automation and information technology procurement.

The primary Federal mechanisms for information dissemination are the Federal agencies themselves; the U.S. Government Printing Office (GPO), which includes about 5 percent of agency publications in the GPO Superintendent of Documents Sales Program and roughly one-half of agency publications in the Depository Library Program (DLP); the National Technical Information Service (NTIS), which sells scientific and technical documents provided by the agencies; the Consumer Information Center (CIC), which distributes free or low-cost consumer pamphlets for the agencies; and various private sector vendors operating under government contract. Federal information is also disseminated by numerous intermediary mechanisms, such as the press, libraries, and commercial vendors who, on their own initiative, enhance and/or resell government information.

The number of civilian agency publications in paper format appears to be declining slowly, while the number of publications in electronic format has more than tripled over the past 4 years. Civilian agencies reported, as of fiscal year 1987, over 7,500 information products disseminated electronically. Paper is still by far the dominant format (accounting for 80 to 90 percent of total information products), but significant agency use of some electronic formats is already occurring for some purposes. For example, statistical data are highly suited to electronic formats, and, based on results of the General Accounting Office (GAO) survey, about one-third of the civilian agencies use magnetic tape or disks, one-fifth floppy disks and electronic data transfer, and one-tenth electronic mail for dissemination of statistical data. By comparison, about two-thirds of the agencies use paper and roughly one-tenth use microfiche for disseminating statistical data.

Many Federal agencies have taken initiatives with respect to the use of electronic information technologies for information dissemination. Electronic technologies have penetrated the majority of agencies in every aspect of the information process. The GAO survey results suggest roughly one-half to two-thirds of the civilian agencies make at least some use of floppy disks, magnetic tapes or disks, electronic data transfer, and electronic mail for information collection/filing and dissemination. About one-third of the agencies have desktop publishing systems, roughly one-half have electronic photocomposition capability, and roughly one-quarter have electronic publishing systems.

A key characteristic of the current Federal information infrastructure is that while Federal agencies and private companies disseminate Federal information in paper and, increasingly, electronic formats, the central governmentwide dissemination mechanisms (GPO/SupDocs, NTIS, DLP, CIC) are presently limited largely to paper (or paper and microfiche).

Evaluating agency satisfaction with the various dissemination channels is difficult. Available survey data for dissemination of paper formats are subjective in nature. Not surprisingly, the civilian agencies rated their own dissemination services as generally of high quality, timely, and moderate to low in cost. Agencies rated GPO slightly lower in timeliness and slightly higher in cost, and NTIS somewhat lower in quality and timeliness and higher in cost. Commercial vendors were rated about the same as the agency. With respect to GPO, there appears to be overall agency satisfaction with respect to traditional ink-on-paper composition, printing, and binding, However, there is continuing dissatisfaction among some agencies with respect to GPO cost, timeliness, estimating and billing procedures, and marketing/distribution of printed products.

INTRODUCTION

The Federal Government today stands at a major crossroads with respect to numerous policy, oversight, and operational aspects of Federal information dissemination. Advances in information technology over the past decade, and especially in the past few years, have opened up many new opportunities for information dissemination—for all segments of American society. Each year the private commercial sector generates literally thousands of new information technology-based products and services (including hardware, software, and application packages), many of which are currently or potentially applicable to Federal information dissemination.

Over the past several years, technological applications such as optical disks, electronic mail and bulletin boards, electronic and desktop publishing, electronic printing on demand, and the like have become technologically feasible and economically viable for widespread application in the Federal Government as well as the private sector. The vast majority of Federal agencies are experimenting with some of these technologies, and some agencies are already implementing major operational applications.

Capturing the full benefits of these technologies involves consideration of a wide range of Federal policy, oversight, and operational questions as they relate to information dissemination. In order to assess this broad topic, the Office of Technology Assessment (OTA) commissioned a series of staff and contractor research papers, sought related studies and information from various executive and legislative branch agencies, and drew on the results of an extensive GAO survey of Federal agency practices and plans.

This chapter provides a technological and institutional overview of Federal information dissemination. The chapter addresses the following specific areas:

- the size and scope of the current Federal information dissemination enterprise;
- the technological initiatives already underway in Federal agencies; and
- the institutional bases for Federal information dissemination.

Each of these is discussed below. This overall picture of the Federal information dissemination enterprise provides an important part of the context for the rest of this report.

SIZE AND SCOPE OF FEDERAL INFORMATION DISSEMINATION ENTERPRISE

For purposes of this study, OTA defined "Federal information" as information collected and/or developed by the Federal Government to carry out government functions and agency missions and considered "public" (legally available to the public and not subject to exemptions under the Freedom of Information Act, such as law enforcement, investigative, proprietary, and classified information). Such public information runs the gamut from statistical data and computer models, to reports, periodicals, and directories, to rules, regulations, and circulars, to maps, charts, and photographs. Also, OTA included most formats of Federal information in the scope of study —including paper, microforms, and electronic.

Estimating the magnitude of Federal information dissemination activities is difficult at best. There are no credible prior estimates and only very rough estimates can be made, since there is no systematic reporting of budget and activity data for Federal information dissemination.

Based on the GAO survey results, with 173 agency components responding, the minimum dollar amounts spent by the Federal Government (civilian and military) in fiscal year 1983 and fiscal year 1987 for relevant activities are shown in Table 2-1.

The total of about $3.2 billion in reported fiscal year 1987 expenditures is undoubtedly conservative. Inspection of individual agency responses indicates that many agencies did not provide complete responses because they did not have and/or could not estimate relevant expenditures. Based on examination of selected agency responses that appear to be especially well done, it appears that about one percent of agency budgets on the average are devoted to information dissemination, which would translate into about $6 billion (1 percent of the roughly $600 billion Federal budget, excluding interest on the national debt and transfer payments), or about twice the total figure reported to GAO. Agencies vary widely in the budget percentage reported to be allocated to information dissemination, and many well exceed the one percent level, as illustrated in Table 2-2.

Table 2-1.—Federal Expenditures on Information Dissemination, Civilian and Military (In billions of dollars)

	Fiscal year 1983	Fiscal year 1987
Agency information clearinghouse operations	$1.500	$1.70
Agency printing and publishing	0.900	1.10
Agency library operations	0.200	0.30
Agency research, development and testing on information dissemination	0.005	0.05
	$2.605	$3.15

SOURCE: GAO Survey of Federal Agencies, 1987.

Also, these estimates do not include the costs of dissemination of technical information for weapon systems and other applications in Department of Defense (DoD), which are largely sensitive or classified in nature. Nor do these estimates include expenditures for the collection and development of the information disseminated, or even a prorated portion of expenditures for basic agency automation and information technology procurement. And these estimates do not include the cost of federally funded research, development, or other activities on which a significant portion of the information collection, development, and/or dissemination was based.

The GAO results provide a rough profile of the number of information dissemination activities. The data are presented in Table 2-3 for fiscal year 1983 and fiscal year 1987, with a breakdown for DoD, civilian departments, and civilian independent agencies. Again, due to incomplete reporting from various agencies, these numbers must be considered as minimum estimates of activity levels. For example, GPO reports that about 58,000 titles were distributed to depository libraries in fiscal year 1987, or about 40 percent more than reported by the agencies to GAO. However, assuming a random distribution of errors, the general trends portrayed should be reasonably accurate.

The data suggest the following conclusions about the Federal information dissemination enterprise:

- DoD accounts for the largest share of total Federal Government publications, with about 82 percent of the titles and 96 percent of the pages (originals, not copies) as of fiscal year 1987.
- However, an insignificant percentage (less than 1 percent) of DoD publications are sold by GPO or included in the DLP. This may be explained in part because many of these documents are considered to be

Table 2-2.—Illustrative Agency Expenditures for Information Dissemination, Fiscal Year 1987

Agency	Total agency budget	Research, development and testing	Printing and publishing	Library operations	Information clearing-house	Totals dollars[a]	Totals percent[b]
	Information dissemination budget (in millions of dollars)						
Library of Congress	239.3	0.6	4.1	—	—	4.7	2.0
US Navy	86,584.4	4.6	207.8	40.5	0.2	253.1	0.3
Economic Research Services (USDA)	44.0	—	1.1	0.1	0.05	1.25	2.8
Patent and Trademark Office (DOC)	255.8	32.5	18.3	4.7	—	55.5	21.7
Natn'l Bureau of Standards (DOC)	224.8	0.2	0.8	1.7	—	2.7	1.2
Natn'l Oceanic and Atmospheric Admin. (DOC)	1,113.1	—	56.8	1.8	—	58.6	5.3
Bureau of the Census (DOC)	363.1	—	7.9	1.0	—	8.9	2.5
US Geological Survey (DOI)	632.4	0.5	14.6	3.2	1.2	19.5	3.1
Federal Elections Commission	12.9	—	0.4	0.2	0.4	1.0	7.8
Federal Energy Regulatory Commission	101.5	—	2.4	0.5	0.6	3.5	3.4
Federal Trade Commission	65.0	—	0.6	1.2	—	1.8	2.8
Securities Exchange Commission	114.5	6.4	1.1	0.6	—	8.1	7.1

[a] Total agency expenditure for information dissemination activities.
[b] Agency information dissemination expenditures as a percentage of the total agency budget.

SOURCE: GAO Survey of Federal Agencies, 1987.

Table 2-3.—Selected Federal Agency Information Dissemination Activities, Fiscal Years 1983 and 1987

	Fiscal year 1983			Fiscal year 1987		
	DOD[a]	DEP[b]	IND[c]	DOD	DEP	IND
Publications printed						
Number of titles	339K[d]	60K	29K	334K	54K	20K
Number of pages	93M[e]	4.2M	0.63M	93M	3.7M	0.55M
Printed publications accepted into GPO's sales program						
Number of titles	323	3.6K	1.2K	295	2.8K	0.9K
Number of pages	80K	435K	182K	72K	277K	105K
Printed publications included in Federal Depository Library Program						
Number of titles	762	38K	2.7K	776	36.5K	3.6K
Number of pages	111K	7.1M	0.27M	110K	7.7M	0.26M
Information products disseminated electronically						
Number of titles	104	1,461	1,001	307	6,261	1,521

[a] DoD – Department of Defense Agency components
[b] DEP – Civilian departmental agency components
[c] IND – Civilian independent agency components
[d] K – thousands
[e] M – millions

SOURCE: GAO Survey of Federal Agencies, 1987.

sensitive and/or to have very narrow and limited demand.

- Of the civilian departmental and independent agency publications (totalling at least 74,000), about 5 percent are sold by GPO and about half (54 percent) are included in the DLP as of fiscal year 1987.
- While the number of DoD publications (titles and pages) has remained roughly constant over the past 4 years (fiscal years 1983-1987), the number of civilian agency publication titles has declined by about 17 percent and the number of pages by about 12 percent. This appears to be paralleled by even a larger decline in the number of titles accepted into the GPO sales program (down about 23 percent). GPO reports that the total number of titles in the sales program increased from 17,513 in fiscal year 1983 to 26,123 in fiscal year 1987 (up 49 percent). But this includes periodicals, forms, carryover documents, and the like in addition to current year publications, and is not necessarily inconsistent.
- The number of titles in the DLP appears to have remained roughly constant over the past 4 years, with the number of pages showing a modest increase (about 8 percent). The Depository Program includes, as of fiscal year 1987, about one order of magnitude (10 times) greater number of titles than are available from the GPO sales program.
- The number of information products disseminated electronically appears to have increased dramatically over the past 4 years, by about 200 percent for DoD, 300 percent for the civilian departments, and 50 percent for the civilian independent agencies. The estimated total number of civilian agency electronic information products for fiscal year 1987 was 7,782, up from 2,462 in fiscal year 1983.

The scope of Federal information dissemination cuts across all types of public information. As reported to GAO by 114 civilian departmental components and 48 civilian independent agencies, the profile is shown in Table 2-4.

The formats currently used for Federal information dissemination cover the entire spectrum. Paper is still by far the dominant format. However, significant use of some electronic formats has already occurred. For the 114 civilian departmental agency components and 48 civilian independent agencies reporting to GAO, nonpaper formats are used most extensively for dissemination of scientific and technical information and for statistical information, as indicated in Table 2-5.

The use of nonpaper formats is also occurring, although on a more selective and limited basis, for certain other types of information. The uses of nonpaper formats reported by more than 5 percent of the civilian departmental agencies responding are shown in Table 2-6, by type of information.

In sum, Federal information dissemination has already begun the transition to significant use

Table 2-4.—Types of Public Information Dissemination by Federal Agencies

	Percent of agencies responding	
Types of public information	Departmental agencies	Independent agencies
Pamphlets/bulletins	82	94
Press releases	79	94
Statistical data	75	75
Directories/catalogs/ bibliographics	69	83
Manuals	64	67
Scientific and technical information	63	65
Contractual specs/ documents	63	83
Administrative reports	62	88
Rules, regulations, directives, circulars	62	85
Maps, charts, photos	54	50
Decisions/opinions	46	71
Professional journals/ proceedings	45	54
Laws/statutes	41	44
Software products	30	25
Satellite imagery/data	6	6

SOURCE: GAO Survey of Federal Agencies, 1987.

Table 2-5.—Agency Dissemination of Scientific and Technical Information and Statisical Data, by Format

Format	Departmental agencies	Independent agencies
Dissemination of scientific and technical information	**Percent of agencies responding**	
Paper	61	65
Microfiche	19	21
Electronic data transfer	15	10
Magnetic tape/ disk	14	13
Videotape	13	8
Floppy disk	9	10
Microfilm	8	6
Film	8	4
Electronic mail	6	8
Electronic bulletin board	6	2
Videodisk	2	—
Dissemination of statistical data	**Percent of agencies responding**	
Paper	73	75
Magnetic/tape/disk	32	29
Floppy disk	19	17
Electronic data transfer	18	10
Microfiche	12	13
Electronic mail	8	8
Microfilm	5	13
Electronic bulletin board	4	4
Videotape	2	—
Film	1	—

SOURCE: GAO Survey of Federal Agencies, 1987.

Table 2-6.—Agency Use of Nonpaper Formats for Information Dissemination by Type of Information

Type of information	Percent of agencies responding
Administrative reports	
Electronic mail	14
Electronic data transfer	12
Floppy disk	8
Magnetic tape/disk	6
Microfiche	5
Pamphlets/bulletins	
Microfiche	10
Electronic mail	9
Press releases	
Electronic mail	13
Electronic data transfer	7
Videotape	6
Electronic bulletin board	5
Directories/catalogs/bibliographics	
Microfiche	11
Electronic data transfer	9
Magnetic tape/disk	9
Floppy disk	5
Manuals	
Floppy disk	5
Contractual specs/documents	
Floppy disk	5
Rules, regulations, directives, circulars	
Electronic mail	9
Floppy disk	6
Maps, charts, photos	
Film	8
Software products	
Magnetic tape/disk	18
Floppy disk	17
Electronic data transfer	6

SOURCE: GAO Survey of Federal Agencies, 1987.

of electronic formats. While paper is still dominant, it appears that electronic formats are already used more frequently than microfilm or microfiche for many types of information. While microform still has important archival benefits, the sectors in which microfiche is used relatively heavily (e.g., scientific and technical information, statistical data, directories, bibliographies) are also those in which new technologies, such as compact optical disks, offer the greatest potential.

TECHNOLOGICAL INITIATIVES BY FEDERAL AGENCIES

Many Federal agencies have taken initiatives with respect to the use of electronic information technologies for Federal information dissemination and related activities. The number and scope of these initiatives have grown dramatically over the past 4 years. One indicator is the amount of agency spending for research, development, and testing on information dissemination. Collectively, agencies reported to GAO that this expenditure increased from $5 million to $50 million between fiscal year 1983 and fiscal year 1987. This dollar amount is undoubtedly low, since many agencies did not report or reported incompletely on this item. If DoD is included, the dollar amounts are low by at least an order of magnitude, based on separate DoD estimates. For example, the DoD Computer-Aided Acquisition and Logistics Program (CALS) alone is spending on the order of $150 million per year. The primary focus of CALS is on weapon system technical data (including technical documents such as engineering drawings and specifications developed in support of weapon systems acquisition), much of which is sensitive or classified. However, the magnitude of increase is probably accurate—a roughly 1,000 percent cumulative increase over the past 4 years. There is, at present, no reporting system in DoD or the civilian agencies that systematically collects relevant expenditure or activity data.

The GAO survey results provide a remarkable picture of agency operational use of electronic information technologies for information dissemination. OTA has relied primarily on the GAO survey results for the civilian departmental agencies as being the most representative. As discussed in chapter 1, the defense agencies did not circulate the GAO survey instrument to many major subcabinet agency components, contrary to GAO instructions; therefore, the defense agency responses are likely to be biased by the aggregate responses of the major military departments. On the other hand, the independent agency responses are dominated by a large number of small agencies, with a similar result—the likelihood of bias in the overall aggregate results. However, both the departmental and independent agency results are reported where particularly appropriate. For 114 civilian departmental agency components and 48 independent agencies reporting, electronic technologies have penetrated the majority of agencies in every aspect of the information process. The rank order of technologies in operational use is listed in Table 2-7.

The survey results do not, of course, give the absolute magnitude of each of the above as a percentage of total activity. They provide the relative use, and thus may tend to overstate actual use. In other words, the survey results indicate the percentages of agencies responding that use a specific technology, but not the absolute number of each technology in use. For example, 34 percent of civilian departmental agencies report use of desktop publishing, but the survey instrument did not ask nor did the agencies provide, the absolute number of desktop publishing systems. Nonetheless, the qualitative penetration levels of these technologies are, overall, far greater than indicated in any known prior survey.

It is also noteworthy that significant percentages of civilian departmental agencies are currently prototyping or pilot testing advanced technologies for information storage and dissemination including those listed in Table 2-8. Also, it appears that about half of the civilian departmental components will soon have desktop publishing systems (34 percent already have operational capability, and another 15 percent are prototyping or pilot-testing), about one-half will soon have electronic photocomposition capability (44 percent now, plus 8 percent in prototyping or pilot-testing), and about one-third will soon have electronic publishing systems (21 percent now, plus 11 percent prototyping or pilot-testing). For the independent agencies, more than one half will have desktop publishing (29 percent now, with another 31 percent prototyping or pilot-testing), one-half already have electronic photocomposition (with another 13 percent prototyping or pilot-testing), and about two-fifths will have electronic publishing (31 percent now plus 13 percent in prototype or pilot testing).

Where available, quantitative estimates of Federal Government use of key technologies are generally consistent with the results of the GAO survey. For example, based on all available data, OTA estimates that the Federal microcomputer inventory has increased from a few thousand in 1980 to (conservatively) over 500,000 today, with a million microcomputers likely within 2 years if current agency procurement plans are fully implemented. The microcomputer is a key component of agency electronic publishing and dissemination activities. OTA estimates that the Federal agency inventory of high-end electronic laser printers has increased from a handful in 1980 to several hundred today, and low-end desktop laser

Table 2-7.—Agency Use of Information Technologies

Technology	Percent of agencies responding	
	Departmental agencies	Independent agencies
Information collection/filing		
Floppy disk	73	67
Magnetic tape/disk	64	63
Electronic data transfer (computer to computer)	60	56
Electronic mail	50	48
Computerized telephone calls	18	21
Nonpaper storage		
Floppy disk	76	73
Magnetic tape/disk	66	73
Micrographics (microfilm/fiche)	54	71
Videodisk	9	6
CD-ROM (Compact Disk-Read Only Memory)	4	8
Optical disk (WORM)	1	4
CD-I (Compact Disk-Interactive)	0	2
Optical disk-erasable	0	2
Printing		
Computer graphics	66	58
Laser and non-impact printing	64	81
Photo-offset printing	54	63
Computer-aided page makeup	50	52
Electronic photocomposition	44	50
Desktop publishing systems	34	29
Electronic publishing systems	21	31
Microform printing	18	29
Electronic dissemination		
Floppy disk	61	58
Magnetic tape/disk	58	60
Electronic data transfer	50	52
Electronic mail	46	40
Videotape	46	52
Electronic bulletin board	35	17
Teleconferencing	33	33
Film	30	31
Broadcast TV	16	19
Videodisk	9	6
One-way cable TV	8	10
Videoconferencing	8	8
Digital cartographic systems	7	2
CD-ROM	4	2
Selective dissemination of info	4	8
Expert systems	3	2
Videotext/teletext	3	6
Interactive cable TV	3	2
CD-I	0	—

SOURCE: GAO Survey of Federal Agencies, 1987.

printers and desktop publishing software have increased from very few in 1980 to several tens of thousands today. Since a microcomputer, laser printer, and software are the major components of a desktop publishing system, OTA conservatively estimates that there are 30,000 desktop publishing systems and 300 high-end electronic publishing systems in the Federal Government.

The GAO survey results are generally consistent with the results of OTA's own research and contractor case studies of selected agencies. For example, all three military services (Army, Navy, and Air Force), as well as the Office of the Secretary of Defense, have major electronic publishing and dissemination systems under development or in operation. In the civilian sector, the U.S. Geological Sur-

Table 2-8.—Agency Prototyping or Testing of Advanced Technologies

Storage technology	Percent of agencies responding: Departmental agencies	Percent of agencies responding: Independent agencies
CD-ROM[a]	15	10
CD-I[b]	6	2
WORM[c]	10	10
Dissemination technology		
CD-ROM	11	10
CD-I	5	2
Expert systems	7	8

NOTES:
[a] Compact Disk-Read Only Memory
[b] Compact Disk-Interactive
[c] Write Once Read Manytimes

SOURCE: GAO Survey of Federal Agencies, 1987.

vey and Bureau of the Census (among others) are collaborating on information dissemination via Compact Disk-Read Only Memory (CD-ROM) and digital cartographic technologies. A capsule description of selected highlights is given below.

- **DoD, Office of the Secretary of Defense (OSD)**: DoD is implementing the Computer-Aided Acquisition and Logistics Support (CALS) program designed as an integrated system for the creation, storage, revision, and dissemination of technical information relevant to weapon systems. CALS is designed to use state-of-the-art electronic publishing technology and incorporates an extensive set of technical standards for electronic exchange of information, page markup, graphics, and the like. The objective is eventually to convert current paper flows of information to digital electronic flows, so that engineering drawings, technical manuals, logistics records, and life-cycle data are created and accessed in electronic formats. CALS participants include OSD, Army, Navy, Air Force, the Defense Logistics Agency, and the private defense contractors. The CALS consolidated budget for DoD is roughly $150 million per year.
- **DoD, Defense Technical Information Center (DTIC)**: DTIC, a component of the Defense Logistics Agency, is implementing a Defense Applied Information Technology Center, in cooperation with OSD and the Joint Chiefs of Staff. The Center includes four laboratories:
  1. Defense Gateway Laboratory, which will facilitate electronic access to over 800 diverse DoD, commercial, and Federal databases via the Defense Gateway Information System, and will utilize user-friendly search software along with an online database catalog;
  2. High-Density Information Systems Laboratory, which will develop high-density optical disk storage and retrieval systems with electronic printing, publishing, and dissemination capabilities;
  3. Artificial Intelligence/Decision Support Laboratory, which will explore state-of-the-art software for diagnostics, monitoring, control, and information retrieval, and will research the application of AI/expert system software and display techniques to defense information needs, including online interfacing with the Defense Gateway Information System; and
  4. Interactive Video Laser Disk Systems Laboratory, which will explore innovative disk techniques for training prospective users of the various high-technology systems under development.
- **NOAA, National Geophysical Data Center (NGDC)**: NGDC has prepared a prototype CD-ROM on selected geomagnetic and solar-terrestrial physics data, including data on solar flares, sunspots, and wind. NGDC makes this data available to users at reduced cost (e.g., the disks cost about $50 each at a volume of 600 copies—including costs of data preparation, software, premastering, mastering, and duplication —compared to a cost of about $500 for the same data on magnetic tape). The CD-ROM runs on any IBM-PC AT or XT or compatible microcomputer with 512 kilobyte random access memory, 10 megabyte hard-disk drive, standard floppy-disk drive, and CD-ROM reader and software using the High Sierra standard at a total

cost of under $4,000. By comparison, magnetic tapes require a mainframe or minicomputer and peripheral equipment at a total cost of several tens to hundreds of thousands of dollars or more.

- **DOI, U.S. Geological Survey (USGS):** USGS has prepared a prototype CD-ROM on mapping data for the Gulf of Mexico, known as Project Gloria. The prototype was prepared with NOAA (which developed the search software) and the Jet Propulsion Laboratory (which developed an interactive image display program). The combined software permits the user to search the database by geographical mapping areas, latitude, and longitude, and to display the data in graphic and variable image formats. USGS views microcomputer-based CD-ROM applications as the key to dramatically improving access to and reducing the cost of many earth science databases maintained by USGS, NOAA, NASA, and other Federal agencies, and, accordingly, has already purchased CD-ROM premastering equipment.
- **DOC, Bureau of the Census:** The Census Bureau offers a full range of products in electronic format in addition to paper and microfiche. Electronic formats include: CENDATA, an online information service including press releases, statistical summaries, product announcements, and the like, and available via DIALOG Information Services, a private vendor; electronic bulletin boards that provide instantaneous access to selected census data (including most CENDATA entries) to participants in the State Data Center program and the Federal-State Cooperative Estimates Program; floppy disks containing data from such Census reports as the *County and City Data Book* and *County Business Patterns* and, on request, data downloaded from magnetic tapes in the Census inventory; and magnetic tapes that contain large volumes of Census data, frequently in more detail than is available in the paper publications, and sell for $175 per tape (6,250 bits per inch). In the future, CD-ROMs will be used for dissemination of statistical data to microcomputer users (Census has already prepared prototype disks and envisions a significant role for CD-ROM for distributing the results of the 1990 census).

In the legislative branch, GPO has initiated technology innovation projects in several areas, including dial-up desktop to mainframe electronic printing capability, dial-up fiber optic links for remote photocomposition, and long-distance electronic data transfer. While GPO disseminates its information products primarily in paper format (and secondarily microfiche), the majority of inputs to GPO is already in electronic format. (GPO pilot projects are discussed in ch. 4, 7, and 8. Other executive agency electronic pilot projects are discussed in ch. 3, 5, and 10.)

In sum, the current initiatives of the Federal Government, taken as a whole, indicate a very significant use of advanced information technology. While use varies widely by agency, and even within agencies, overall the government appears to be at or close to the threshold where technology-based electronic information dissemination can be a significant and integral part of the Federal information infrastructure.

INSTITUTIONAL INFRASTRUCTURE FOR FEDERAL INFORMATION DISSEMINATION

The primary institutional mechanisms used for Federal information dissemination are the Federal agencies themselves, GPO, NTIS, Consumer Information Center (CIC, located in Pueblo, CO), DLP, and private sector vendors/contractors. Federal information is also disseminated by numerous intermediary mechanisms, such as the press, libraries, interest groups, congressional offices, and the like.

Almost all Federal agencies, and certainly all Cabinet departments, have some explicit statutory authority for information dissemination and many have multiple statutory authorities. **Because Federal agencies collect and/or develop the bulk of Federal information, they are generally the most knowledgeable about their own information products and services, and frequently are the best informed about the current and potential users of that information.** Many agencies have formal and/or informal mechanisms to discuss information needs and problems with users. According to the GAO survey results for 114 departmental agency components, many agencies directly disseminate a wide range of types and formats of Federal information.

GPO, or more precisely the GPO Superintendent of Documents (SupDocs), is statutorily authorized to sell selected agency documents to the general public. The documents selected for the GPO sales program represent only a small fraction (a few percent) of all government publications, and are ones judged by GPO marketing specialists to have significant demand and/or those that by law must be sold to the public. Documents sold by GPO cover a wide range of types of Federal information, but the formats are limited primarily to paper and microfiche, with a few items available in magnetic tape format. (See ch. 4 and 5 for further discussion of SupDocs activities.)

NTIS, pursuant to public law, sells scientific and technical information provided by the mission agencies. The types of information products available from NTIS are much more limited than those available from the agencies or GPO, and are provided to NTIS on a voluntary basis. NTIS products have very limited demand (about 10 copies per item) compared to GPO products. NTIS sells primarily microfiche and paper formats, with some sales of magnetic tape and floppy disk formats. (See ch. 5 for further discussion of NTIS activities.)

CIC (operated on a reimbursable basis by GPO for the General Services Administration), pursuant to public law, primarily facilitates the distribution of consumer-oriented pamphlets and bulletins from the agencies. These materials are usually short and are available free or at a small fee. CIC products are limited to paper formats.

DLP is a cooperative program by which agency documents, whether or not they are sold via GPO or NTIS, are provided to a network of about 1,400 libraries around the United States. Over 50 regional depository libraries receive all documents distributed, while the other depository libraries select which types of documents or titles they wish to receive. DLP was established by public law and is operated by GPO. It serves as part of an "information safety net" by which the government funds the distribution of materials to designated libraries. DLP includes all types of Federal information, but has been limited, until now, to paper and microfiche formats. (See ch. 6 and 7 for further discussion of DLP activities.)

Finally, private sector contractors play a role in disseminating information for many of the agencies. Since, in general, government information cannot be copyrighted, numerous private sector vendors repackage, add value, and sell or resell a wide variety of types of Federal information in a wide variety of formats. The dissemination of agricultural information developed by the U.S. Department of Agriculture (USDA) provides a good illustration of the private sector role. USDA information is disseminated directly by agency components, through private contractors, via private sector online gateways, and by private sector value-added providers. For example, the EDI (Electronic Dissemination of Information) service is provided online on a fee-for-service basis by the U.S. Department of Agriculture (USDA) through a contract with Martin Marietta Corporation. EDI provides time-sensitive daily, weekly, and monthly reports and news releases from USDA agencies. AGRICOLA, an extensive USDA bibliographic reference database on all aspects of agriculture, is provided online via DIALOG Information Services, a commercial database vendor. USDA Online, a USDA current information service including news releases and short reports, is provided via ITT Dialcom, a commercial online electronic mail gateway.

EDI, AGRICOLA, and USDA Online are information products developed by USDA, but disseminated online via private vendors or contractors. There are also many online information products that make use of USDA information, but are developed as well as disseminated by the private sector. For example, Doane Publishing sells AgLine, an online information service that covers USDA daily commodity reports and updates and also offers electronic mail and software capabilities. Pioneer Hi-Bred International sells AGRIBUSINESS U.S.A., a comprehensive online database that indexes agricultural business, trade, and government publications. This database is available via DIALOG Information Services, a commercial vendor. As a final example, Vance Publishing sells ProNet, an online news and information service on the produce industry that incorporates a variety of price, market, weather, and related information from USDA and elsewhere.

The GAO survey results indicate that the 114 civilian departmental agency components responding use several institutional mechanisms for information dissemination with respect to the formats indicated, as shown in Table 2-9.

This highlights one of the key characteristics of the current Federal information infrastructure: while individual Federal agencies and private companies disseminate Federal information in paper and electronic formats, the central governmentwide dissemination mechanisms are presently limited largely to paper (or paper and microfiche). Both GPO/SupDocs and NTIS sell a small number of products in electronic format, but this represents an insignificant percentage of total sales volume for either.

The four governmentwide dissemination agencies collectively distribute about 107 million copies of documents (in paper or microfiche format) per year, as summarized in Table 2-10.

Of these dissemination agencies, only GPO/SupDocs and NTIS maintain customer profiles. Percentage estimates are shown in Table 2-11. The profiles for SupDocs and NTIS are fairly similar, although the use of different categories makes comparisons somewhat difficult. In any event, the largest customer group is business. To keep this in perspective, consumers are, by definition, the primary customer group for CIC, and the libraries are the primary DLP customers. Of course, libraries largely serve an intermediary role, and the ultimate customers of DLP are the patrons of the individual depository libraries. DLP does not at present maintain comprehensive user statistics, although a survey is in progress. However, a 1985 estimate suggests that over 10 million persons use DLP each year, as detailed in Table 2-12, although these estimates have not been validated.

The GAO survey attempted to measure agency satisfaction with the various dissemination channels for typical agency reports (i.e., 50-100 pages, paper format, typeset, some graphics, specified deadline). There are numerous problems in interpreting and using these data. Not surprisingly, the civilian departmental agencies rated their own dissemination services as generally of high quality, timely, and moderate to low in cost for paper products. This is, of course, a self-assessment, and

Table 2-9.—Federal Agency Use of Institutional Mechanisms for Information Dissemination, by Format

	Percent of agencies responding					
Institution	Paper	Microfiche	Electronic mail	Electronic data transfer	Magnetic tape/disk	Floppy disk
Own agency	92	11	25	9	40	33
GPO/SupDocs	65	9	1	1	1	3
NTIS	37	23	1	—	9	7
CIC	18	—	—	—	—	—
Depository Libraries	52	12	—	—	2	1
Private sector vendors/contractors	48	7	9	3	15	11

SOURCE: GAO Survey of Federal Agencies, 1987.

Table 2-10.—Approximate Distribution Volume, Fiscal Year 1987

Dissemination agency	Distribution volume (millions of copies)
GPO/SupDocs (free)[a]	30
GPO/SupDocs (sales)[b]	27
NTIS (sales	6
CIC (free)	21
DLP (free)	23
Total	107

[a] Bylaw and reimbursable
[b] Includes CIC sales

SOURCE: U.S. Government Printing Office and National Technical Information Service, 1988.

Table 2-11.—GPO/SupDocs and NTIS Sales Distribution, Fiscal Year 1987

	Percent of total sales	
	GPO/ SupDocs	NTIS
Business	59	64 (U.S. only)
Private individuals	27	4 (general public)
Foreign	—[a]	20 (business and government)
Federal, State, and local government	8	6
Universities and colleges	6	6 (includes public libraries)

[a] GPO foreign customers included in all other categories as appropriate except Government.

SOURCE: U.S. Government Printing Office and National Technical Information Service, 1988.

Table 2-12.—Estimated Use of Depository Libraries, Fiscal Year 1985

	Actual[a]	Projected[b]
No. libraries reporting	1,188	1,400
Avg. no. weekly users per library	141	141
Total weekly users	167,508	197,400
Total annual users	8,710,416	10,264,800

[a] Based on library estimates; numbers not validated and may include undercounts, overcounts, or doublecounts (multiple users per person).
[b] Projects the average use based on the 1,188 libraries reporting to all of the approximate 1,400 depository libraries.

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

its validity cannot be objectively determined from the survey results. Agencies rated GPO slightly lower in timeliness and slightly higher in cost for paper products relative to agency views of themselves. NTIS was rated by agencies as somewhat lower in quality and timeliness and higher in cost for paper products. DLP was evaluated as slightly less timely. Commercial vendors were rated about the same as the agency itself. The full comparative data are shown in Table 2-13 (normalized to 100 percent) and expressed as a percentage of the agencies responding to each question, based on 114 civilian departmental components responding.

Given the subjective and general nature of the agency evaluations, these results should be interpreted cautiously. For example, the perceived problems with the quality and timeliness of NTIS documents could be due largely to poor quality and late delivery of copies provided to NTIS by source agencies. Also, the perception that GPO, NTIS, and DLP dissemination is less timely than agency dissemination could reflect the role of GPO and NTIS as secondary rather than primary distributors of agency documents and the delays inherent in a secondary role. And the perception that NTIS documents are more costly than agency, GPO, and commercial sources may reflect the very low volume of sales per NTIS title (and resulting higher per unit costs). Finally, some of the agency responses appear to be questionable. For example, the majority of agencies rated the cost of DLP dissemination as moderate (rather than low or very low), yet for many agencies there is no cost for DLP dissemination. Agencies only pay printing and binding costs when they provide copies directly to DLP for documents not produced by or procured from GPO.

The GAO survey requested additional evaluation detail for GPO. The results indicated that the majority of the departmental agency components responding were satisfied or very satisfied with publications layout, composition, printing quality, printing timeliness, binding, cataloging, marketing/sales, distribution, and depository library services provided by GPO. The one area where one-half were neutral (neither satisfied or dissatisfied) or dissatisfied was printing cost. Some dissatisfaction was also indicated with respect to marketing/sales, printing timeliness, and distribution, as indicated in Table 2-14 (in normalized percentages), based on the civilian departmental

Table 2-13.—Federal Civilian Departmental Agency Evaluation of Information Dissemination Channels

QUALITY
Percent of agencies responding

Dissemination channel	Very high	High	Moderate	Low	Very low
Agency	29.8	45.2	25.0	—	—
GPO	20.9	56.9	19.4	1.4	1.4
NTIS	12.5	30.0	30.0	25.0	2.5
CIC	45.0	50.0	5.0	—	—
DLP	19.3	44.2	34.6	—	1.9
Commercial	22.2	53.7	22.2	1.9	—

TIMELINESS
Percent of agencies responding

Dissemination channel	Very great	Great	Moderate extent	Some extent	Little or no extent
Agency	27.9	45.2	23.1	2.9	1.0
GPO	9.6	31.5	45.2	11.0	2.7
NTIS	—	22.5	57.5	10.0	10.0
CIC	21.1	36.8	31.6	10.5	—
DLP	14.8	25.9	50.0	3.7	5.6
Commercial	13.0	37.0	40.7	7.4	1.9

COST
Percent of agencies responding

Dissemination channel	Very high	High	Moderate	Low	Very low
Agency	1.9	15.3	63.5	13.5	5.8
GPO	6.9	23.3	61.6	8.2	—
NTIS	22.5	45.0	27.5	2.5	2.5
CIC	—	15.0	65.0	5.0	15.0
DLP	1.9	7.5	56.6	11.4	22.6
Commercial	—	14.8	79.6	5.6	—

SOURCE: GAO Survey of Federal Agencies, 1987.

agency components responding. Note that of the 114 agency components that participated, the number that actually commented on specific GPO services ranged from 54 to 91, as indicated in Table 2-14. These 1987 GAO survey results can be compared with the results of a 1987 survey conducted by the Federal Publishers Committee (FPC), an interagency group of printing, publishing, and public information officials, and a 1983 survey conducted by GPO itself. While the FPC survey included many other topics, it did cover several cost, timeliness, and marketing/distribution topics, with the results indicated in Table 2-15. The FPC survey results must be interpreted cautiously since the overall response rate was only about 10 percent (48 respondents out of the 475 persons who were sent the questionnaire). FPC has noted that the 48 respondents included officials from nine cabinet departments (Agriculture, Commerce, Defense, Energy, Health and Human Services, Housing and Urban Development, Interior, Justice, and Labor) and about a dozen independent agencies. FPC has

Table 2-14.—Federal Civilian Departmental Evaluations of GPO Services

GPO Service	No.[a]	Percent of agencies responding: Satisfied	Neutral	Dissatisfied
Publications layout	47	78.0	12.0	10.0%
Composition	66	81.5	10.8	7.7
Printing quality	91	80.0	12.2	7.8
Printing timeliness	91	66.7	17.8	15.6
Printing cost	87	50.0	36.0	14.0
Binding	82	74.1	19.7	6.2
Cataloging	39	73.0	24.3	2.7
Marketing/sales	57	57.9	26.3	15.8
Distribution	67	67.2	21.9	10.9
Depository library	54	78.9	19.3	1.8

[a] Number of agency components commenting on each GPO service.

SOURCE: GAO Survey of Federal Agencies, 1987.

Table 2-15.—Federal Publishers Committee Survey of GPO Services, Selected Results

Area of concern	Number of respondents Adequate	 Needs improvement
Billing delays and discrepancies	8	29
Cost of GPO inhouse work	9	7
Delivery date reliability	14	22
Quality, timeliness, and cost controls of GPO contractors	11	25
Accuracy and adequacy of SupDocs sales information	13	11

SOURCE: Federal Publishers Committee Survey, 1987.

submitted the complete survey results and related recommendations to GPO for comment and followup action where appropriate.[1]

In 1983, the GPO Inspector General conducted an audit of customer satisfaction with GPO services, based on a questionnaire sent to agency customers. The response rate was over 90 percent, with 125 out of 136 agencies completing the questionnaire. Six areas appeared to be of greatest concern to customers, with 38 to 70 percent of the respondents dissatisfied at least some of the time with regard to:

1. lack of advance notice to agencies when due dates slip;
2. failure to complete jobs on time;
3. failure to bill jobs in a timely manner;
4. failure to provide accurate cost estimates in a timely manner;
5. improper or unclear levying of surcharges; and
6. improper packaging, labeling, or delivering of jobs by GPO contractors.

This survey is, of course, dated, and GPO has not conducted a similar followup survey.

In addition to being 5 years old, the 1983 GPO survey has been criticized because it was based on the opinions and perceptions of GPO's customer agencies. The GPO Inspector General did not attempt to validate the responses by checking records or seeking corroboration from multiple sources within a given agency. However, the 1987 GAO and FPC surveys are subject to this same criticism.

Taking all information into account, there appears to be overall satisfaction with GPO services with respect to traditional ink-on-paper composition, printing, and binding, but continuing dissatisfaction among some agencies with respect to cost, timeliness, estimating and billing procedures, and, possibly, marketing/distribution of printed products. GPO has instituted improvements in its customer service operations in recent years. And FPC has acknowledged that GPO "has greatly increased its responsiveness to agency needs;" but FPC "is not satisfied that many of the longstanding problems are being resolved."[2] Opportunities for further improvement are considered in chapters 4 and 11.

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[1] Memorandum from John E. Mounts, Chairman, Federal Publishers Committee, to Ralph E. Kennickell, Jr., Public Printer, on "Recommendations from Federal Publishers Committee to Government Printing Office," May 13, 1988.

[2] Ibid.

Chapter 3

Key Technology Trends Relevant to Federal Information Dissemination

Clockwise from top left: National Library of Medicine CD-ROM Disk (photo credit: Doug Jones, National Library of Medicine); satellite (photo credit: USA Today, all rights reserved); and gallery of Bureau of the Census data products (photo credit: Neil Tillman, Bureau of the Census).

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Chapter 3

Key Technology Trends Relevant to Federal Information Dissemination

SUMMARY

The results of the General Accounting Office (GAO) surveys of Federal information users (see chapter 4) and prior studies on the future of paper and paper-based media (such as books) indicate that paper is expected to decline only marginally as a preferred format in the next few years, although this decline could become significant for specific types of information (e.g., bibliographic, reference, statistical, scientific, and technical) that are highly suited to electronic access and manipulation. The outlook for microform is less favorable. Microfilm is currently used very little for Federal information dissemination; microfiche, while used extensively, is expected to decline significantly as a preferred format, except for records storage and archival purposes.

In sharp contrast, the GAO surveys of Federal agencies (see ch. 2) and Federal information users (ch. 4) indicate that plans and preferences for dissemination in electronic formats (e.g., electronic mail and bulletin boards, optical disks) are projected to increase dramatically.

This chapter surveys a number of major technologies and key technical trends relevant to Federal information dissemination. Several key technical trends are expected to continue conservatively for 3 to 5 years and in many cases for at least 10 years, and are combining in such a way that most of these plans and preferences are likely to become reality. These trends include:

- continued steady improvement in the price/performance of microcomputers, which already bring the power of mainframe computers to the desktop at the cost of a stereo set; microcomputers provide the technological underpinning for numerous information collection, processing, and dissemination activities;
- continued, rapid proliferation of desktop publishing systems, comprised of a microcomputer, nonimpact printer, and page composition software (and sometimes a scanner for paper input) in the most basic configuration;
- continued, rapid improvement in the power of desktop publishing software to handle more complex documents, formats, fonts, and the like;
- continued, steady improvement in the price/performance of nonimpact printers, with low-cost desktop printers offering output quality acceptable for most documents, and high-end printers offering quality comparable to some phototypesetters;
- similar improvement in the price/performance of scanners, with the capability of high-end scanners (to handle a wide range of type styles and sizes) migrating to desktop scanners;
- as a combined result of the above trends, overall continued improvement in the ability of desktop systems to produce higher quality, more complex documents, thus further reducing the gap between desktop and high-end electronic publishing and phototypesetting systems;
- for complex, large-volume, and/or large institutional applications, continued improvement in high-end electronic publishing characterized by:
  - —declining cost of software and workstations;
  - —increasingly heavy competition between desktop and high-end systems;

  - —rapidly growing networking of desktop and high-end systems;
  - —rapidly growing networking of workstations with high-end nonimpact printers and phototypesetters;
    - —increasingly heavy competition between and among software, workstation, phototypesetter, and computer equipment vendors, as well as systems integrators and service bureaus and;
    - —continued migration of electronic publishing to other applications such as forms management and multi-format output;
- continued, rapid increase in the number and use of computerized online information services, especially for information search and retrieval, electronic display, and remote printing-on-demand when needed;
- continued, steady increase in the number of online information gateways that provide the channels for electronic information exchange (such as electronic data transfer, mail, facsimile, and bulletin boards), but not the information itself; these gateways include common carriers (interexchange and bell operating companies), value-added companies, and nonprofit and governmental systems;
- continued advances in the telecommunication technologies that underlie online information services and gateways, including packet switching, fiber optics, satellite networking, FM subcarrier transmission, and integrated switched digital systems;
- rapid advances in optical disk technologies and applications, especially for purposes of information storage and dissemination; advances include:
  - —accelerating penetration of Compact Disk-Read Only Memory (CD-ROM) as remaining standards issues are resolved;
  - —maturation of Write Once Read Many-times (WORM) and erasable optical disks (compact and full size) as technology stabilizes and standards are established;
  - —emergence of Compact Disk-Interactive (CD-I) and other optical disk applications;
- rapid advances in development of expert systems applicable to many aspects of information dissemination—including technical writing, indexing, information retrieval, and printing management; and
- continued, steady progress in development and acceptance of standards for telecommunication, data transfer, optical disks, and page description and text markup.

The net, cumulative effect of these technical trends is to afford the Federal Government the opportunity to realize the kind of significant performance improvements and cost reductions that have been demonstrated in the private sector. Also, the convergence of these technical trends, along with progress in standards-setting, makes information systems integration a real possibility for the Federal Government and other users. Systems integration permits the coupling of input, storage, processing, and output technologies in ways that permit multi-media (e.g., paper, microform, online electronic, and stored electronic) dissemination from the same electronic database. In essence, the key technologies and technical trends highlighted above are central to the emerging movement towards systems integration.

INTRODUCTION AND OVERVIEW

A major objective of this study is to identify and discuss new or evolving ways in which information technology can or might be applied by the U.S. Government Printing Office (GPO), National Technical Information Service (NTIS), and other Federal agencies to the dissemination of Federal information. An important step in this process is the identification of key technology trends that are relevant to information dissemination.

OTA has surveyed a representative cross-section of major technologies relevant to information dissemination. The presentation in this chapter emphasizes electronic technologies, although paper and microform are discussed briefly. Conventional ink-on-paper printing technologies, including prepress and binding, are considered in chapter 4 in the context of alternative futures for GPO. As discussed in chapter 4, GPO has already upgraded its conventional printing technology to a level comparable to most of the private printing industry. However, GPO has much less experience with online information systems, expert systems, optical disks, and high-end electronic publishing. NTIS is in a similar situation (see ch. 5), as is the Depository Library Program (DLP). Libraries in general, especially the larger research libraries, have more experience with electronic systems (see ch. 6). Thus, this chapter is highly relevant to general consideration of future technological directions for GPO, NTIS, and DLP, as well as the Federal mission agencies.

This chapter emphasizes significant current or emerging technical trends that are expected to persist for at least 3 to 5 years into the future. In many instances, the key trends are likely to continue even longer—perhaps for 10 years or more. In the aggregate, the trends provide what OTA believes is a reliable overall technology planning framework for Federal information dissemination. However, the presentation in this chapter is not intended to be used in the evaluation and selection of specific equipment and systems. **Some examples of equipment, vendors, and/or applications are provided, but for illustrative purposes only. Some cost and performance data also are included for illustrative purposes only. These data change rapidly, and should be checked with vendors if product or service-specific evaluation is contemplated.** Also, the presentation is geared to the level of the informed lay person, not to the technical specialist. For discussion of specialized information technologies not included here (e.g., digital data tapes, digital cartographic systems), the reader should consult a forthcoming OTA staff paper on *Federal Scientific and Technical Information Dissemination.* Finally, for the discussion of telecommunication technologies not covered here (e.g., digital facsimile, videotext, cable television), the reader should consult OTA's forthcoming report on *Communications Systems for An Information Age* (1989).

Information Systems Integration

One important finding is that a combination of technological advances, cost reductions, and current or pending standards has opened up for the first time a real possibility of information systems integration in the Federal Government. The importance of this development cannot be overstated. Until recently, the Federal Government, along with other major information system users, had no choice but to obtain an essentially incompatible complement of information technology hardware and software, such that system integration across the government and major agencies was very difficult, if not impossible. Integration of specific systems within agencies was possible. But even here, major integration efforts, for example in the Department of Defense, still led to numerous incompatible systems.

The relevance to Federal information dissemination is immediate and direct. It is now possible to conceive of, plan for, design, and implement an integrated information dissemination system (or more likely a network or hierarchy of systems) for the Federal Government. This is possible because of advances in a whole range of relevant technologies—including input, storage, processing, and output technologies—that can deal with the entire range of media, including paper, microform, magnetic disk, optical disk, and direct electronic. And the cost/performance trends in these technologies are likely to make a wide range of applications cost-effective when compared to conventional methods.

Two other related trends are equally important. One is the trend toward standards for systems interconnection at the hardware, software, and applications levels. There is strong movement among the vendor and user communities and in the various national and international standards bodies towards a hierarchy of standards that will make it possible for a wide range of information systems to talk with and exchange information with each other.

Another trend is the rapid penetration of computerized information systems in all sectors of society, but especially in the business, educational, and research communities. This means that many of those who provide information to the government and use information from the government can now or soon be electronically connected, and can, where appropriate, send and receive information in a variety of electronic formats. This in no way suggests an end to paper-based information products—but only that paper can be used where it is really needed and in a more efficient and cost-effective manner.

Realizing this potential for information systems integration requires, of course, more than just the technology and standards. A variety of institutional and policy changes may be necessary, and various alternatives will be discussed in later chapters.

Nonetheless, it appears that the technology, the industry, the standards, and the government are all moving towards systems integration. It is now possible to envision, in the relatively short term, a Federal information dissemination environment that includes the following illustrative elements:

- document/data entry (e.g., scanning, word processing, facsimile);
- document revision/composition (e.g., electronic publishing—desktop and high-end, computer graphics);
- document storage (e.g., electronic database, optical disk);
- document output (e.g., electronic publishing, laser printing, photo offset); and
- document distribution (e.g., optical disk, electronic mail, computer diskette, online electronic, paper copies, microform).

Indeed, electronic publishing can be viewed as a key integrative technology because it can serve to integrate the various formats (paper and microform as well as electronic) of information input, processing, storage, and output within a common technical framework. Electronic publishing can also serve to connect the various so-called islands of automation in an organization—office automation, publishing systems, database systems, records management, document storage systems, and the like. Standards on information exchange are critical, as is the need to find ways for the people who work in various areas of automation to work more effectively together.

The Microcomputer Revolution

Most Federal Government information is either collected from the private sector, State/local government, and the general public, or is created by Federal employees and contractors as the result of studies, analyses, research, and the like. Even information collected from outside the government is frequently subject to analysis by Federal employees, and in that sense has a creative or value-added aspect.

The dominant technology relevant to the collection and creation of Federal information is the microcomputer. Over the last 5 years or so, the United States has witnessed a revolution in computer technology that has brought the power of the mainframe computer to the desk of millions of public and private sector employees and citizens. And this revolution is expected to continue for at least another 5 years.

The sheer magnitude of this microcomputer revolution can be measured in many different ways. For example, the Federal Government itself has gone from only a few thousand micros in 1980 to roughly 200,000 in 1986 to 500,000 in 1988 to a projected 1 million by 1990. The percentage of school districts with computers had already increased from about 18 percent in 1981 to over 90 percent by 1985, according to the National Center for Educational Statistics.[1] In the business community, microcomputers drew even in total computing power with mainframes and superminis as of 1985 and are projected to dominate by 1990, according to Dataquest.[2] Indeed, various projections show microcomputers growing at an average 10 to 15 percent through 1990, compared to about 5 percent for mainframes and superminis. The logic of this trend is understandable when one considers that the IBM personal computer systems, selling for less than $10,000 are equivalent in computing power (measured in millions of instructions per second) to the IBM 370-168 mainframe computers that sold for several million dollars when introduced in the mid-1970s.

Even the home market has had significant microcomputer penetration, with about 19 million households buying a microcomputer since 1981 (about 14 percent of all households).[3] Link Resources projects an ultimate home penetration of about 35 percent, although this may be conservative if full function microcomputers drop to the $300-500 price range in the next 3-5 years.[4] This would place the microcomputer in the same price range as a good quality 19-inch color television.

The continuous improvement in price/performance of microcomputers is driven in part by advances in semiconductor chip technology, which shows no signs of slowing down. The 32-bit chip family (such as the Intel 80386 or the Motorola 68020) made possible the latest personal computer systems that are more powerful, more user friendly, and more compatible with each other. Price/performance is expected to continue to improve as the 32-bit chips are further assimilated in microcomputer product offerings and as next generation microcomputers are developed and introduced.

The important impact on Federal information collection and creation is that an already large and increasing amount of information is generated in electronic form, that is, by capturing electronic keystrokes with a microcomputer or word processor. Today, much of this electronic information is submitted to or provided by the government in paper form. But the potential exists to substantially reduce the amount of rekeyboarding, and presumably the cost of such information, by maintaining the information in electronic form as long as possible.

The Continuing Role of Paper and Microform

A note of caution with respect to the role of paper is in order. Despite the dramatic increase in computer technology and electronic information, paper documents are expected to have a continuing, major role for several reasons. First and foremost, for documents of significant length, research has found that reading from a computer screen is much more difficult than reading from paper, despite improvements in the design and resolution of screens and terminals. Even extensive practice at electronic reading does not appear to make a significant difference. Second, paper continues to be a more convenient and portable medium for many purposes, and accommodates a wide range of reading styles and locations. Third, for many documents, paper is still a bargain, although this is changing with the advent of optical disk storage technology. And of course, electronic publishing can significantly increase the efficiency of paper use, even when the final product is still in paper format. Fourth, the paper format (especially for lengthy reports and books) permits the reader to browse through material and use a variety of conscious or subconscious search patterns that may be difficult if not impossible to replicate even with today's computer-based search and retrieval software. Reading paper formats can lead to greater comprehension.

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[1] Cited in J. Bloomdecker, *Computer Crime, Computer Security, Computer Ethics* (Los Angeles, Calif. National Center for Computer Crime Data, 1986).

[2] Cited in G. Lewis, Zoom! Here Come the New Micros," *Business Week*, Nov. 1, 1986 pp. 82-92.

[3] E. Roth, "Power Surge in Personal Computers," *Editorial Research Reports*, vol. 1, No. 1, Jan. 9, 1987, p. 4.

[4] Ibid, p. 6.

Overall, most studies on the future of paper and paper-based media (such as books) have concluded that the paper format will play a major role as a medium of information storage, exchange, and dissemination for the foreseeable future.[5] The results of the GAO surveys of Federal information users (summarized in ch. 4) indicate that paper is expected to hold steady or decline only marginally as a preferred format in the next few years, although this decline could become significant for specific types of information (e.g., bibliographic, reference, and statistical) that are highly suited to electronic access and manipulation. At the same time, the preference for electronic formats (e.g., electronic mail and bulletin boards, floppy disks, and compact optical disks) is expected to increase dramatically.

The outlook for microform (microfilm and microfiche) is not as favorable as for paper or electronic formats, but there is likely to be continuing significant use of microforms for records storage and archival purposes for the foreseeable future, or at least until electronic alternatives have been fully established and stood the test of time. Microform is well suited for archival purposes because it requires less storage space (compared to paper), has a longer shelf life (compared to paper and electronic, although this may change), is a stable access technology (compared to electronic), and is lower in cost (compared to paper and some electronic).[6] Microform offers a lifetime of 100+ years, whereas the lifetime of acidic paper is perhaps several decades, and magnetic media (tape and disks) a few years to a decade or two. The main competitive threats to microform for archival purposes are from acid-free paper (which can last 100+ years, but would still require more storage space and be more costly than microform) and optical disks. Optical disks do not as yet have proven archival capability (although manufacturers are claiming 40+ years), require less storage space, and can be less expensive than microform. Microform is likely to continue as a major archival medium at least until optical disks (or some related electronic-storage technology) are well established.

However, for many nonarchival purposes, microform is not the preferred medium even today. For reading lengthy written materials, users find microform to be inconvenient, uncomfortable, and inefficient compared to paper. For information search and retrieval, users frequently prefer electronic formats, including online database systems as well as, increasingly, offline media such as CD-ROMs. The results of the GAO surveys of Federal information users (summarized in ch. 4) indicate that microfilm is little used today for Federal information dissemination, and that microfiche, while used extensively, is expected to decline significantly as the desired format for dissemination of many types of Federal information. It should be noted, however, that the micrographics industry is itself using electronic technology to continuously upgrade microform access technologies, such as computer-assisted microfiche retrieval systems and computer-output microfilm systems.[7] Also, the technology for microfiche to paper conversion continues to advance. For example, the Defense Technical Information Center recently funded the development and installation of duplex (two-sided) microfiche copier machines.

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[5] See, for example, Priscilla Oakeskott and Clive Bradley (eds.), *The Future of the Book: Part I – The Impact of New Technologies* (Paris Unesco, 1982); U.S. Congress, Joint Committee on the Library, *Books in Our Future*, A Report From the Librarian of Congress to the Congress, S. Print 98-231, U.S. Government Printing Office, Washington, DC, 1984; John Y. Cole, *Books in Our Future: Perspectives and Proposals* (Library of Congress, Washington, D.C. 1987).

[6] See, for example, Kenneth E. Dowlin, *The Electronic Library: The Promise and the Process*, (New York, Neal-Schuman, 1984; F.W. Lancaster, Libraries and Libraries in An Age of Electronics (Arlington, VA: Information Resources Press, Arlington, VA, 1982); Edward Gray, "The Rise and Fall of Technological Applications: Considerations on Microforms and Their Possible Successor," *International Journal of Micrographics and Video Technology*, vol. 15, No. 1, 1986, pp. 31-38; National Research Council, Committee on Preservation of Historical Records, *Preservation of Historical Records* (Washington, DC, National Academy Press, 1986).

In sum, however, the current and future use of paper, microform, and electronic formats will depend largely on the type of information and the type of information user. The kinds of criteria that will be relevant in selecting format include:

- amount of information to be stored, accessed, and/or distributed;
- amount of storage space available;
- frequency of information access or retrieval;
- length of time information is to be stored;
- desired speed of access or retrieval;
- costs of storage, access, and retrieval;
- number of users; and
- technical expertise of users.

The rest of this chapter focuses on several key electronic technologies relevant to Federal information dissemination. The price/performance characteristics of these technologies make them highly competitive with paper and microform for those types of information well suited for electronic formats.

ELECTRONIC PUBLISHING

Desktop Publishing

One of the microcomputer applications most relevant to this study is desktop publishing. Desktop publishing combines elements of advanced word-processing and computerized page layout and composition systems. Desktop publishing can be defined as a set of hardware and software, including a multifunction personal computer, which has the ability to produce near-typeset quality output, and utilizing multiple type fonts, sizes, and styles and multiple page layouts. The characteristics of desktop publishing are:

- low cost (about $10,000 for an entire system),
- user-friendly software (frequently employing icons and a mouse and a 'what you see is what you get' or WYSIWYG screen display) that requires minimal training,
- near-typeset quality output (but still considerably less than high-quality book and magazine printing, for example), and
- relatively simple and straightforward documents (although the desktop publishing software is much more sophisticated than typical word-processing software).

A typical desktop publishing configuration includes:

- a microcomputer with mouse or digitizing tablet, keyboard, and screen (roughly $2,000 to $4,000 inclusive);
- page composition software (about $500 to $1,000);
- a low-end laser printer (about $1,500 to $3,000); and
- a low-end scanner for paper input (about $2,000 to $4,000).

Desktop publishing is expected to become a standard part of personal computing, and to grow significantly over the next several years. Growth in desktop publishing reflects the substantial potential savings for those types of documents that do not require higher levels of quality and complexity. For simple reports, newsletters, pamphlets, and the like, desktop publishing can cut composition costs from the $50 or more per page range (for commercial composition and typesetting) to the $1 to $5 per page range. Compared to straight word-processing text, desktop publishing can reduce the page length by perhaps 40 percent on average, and this translates into substantial savings from reduced paper and mailing costs. There are also major savings from a streamlined revision process, minimal rekeyboarding, and the ability to store text and graphics for future use and revision.

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[7] See, for example, Coopers and Lybrand, *Information and Image Management: The Industry and the Technologies*, study conducted for Association for Information and Image Management, Silver Spring, MD, 1987.

Two significant limitations of the low-end desktop publishing are limited ability to deal with complex documents (e.g., complicated layouts using text and graphics) and limited print quality (due to the typical 240 dots per inch (dpi) or 300 dpi resolution of low-end laser printer output). The first limitation is being mitigated rapidly by ever more powerful desktop publishing software releases. Also, users can invest in more sophisticated software and, if necessary, obtain software that supports phototypesetters as well as laser printers. Finally, low-end laser printers are improving output resolution, thus reducing the print quality differential between laser printers and phototypesetters.

Desktop publishing has made dramatic inroads in the newspaper and newsletter industries. An estimated 80 percent of newspapers with a circulation of over 100,000 use Macintosh-based desktop publishing, including the *Wall Street Journal* and *USA Today*, as do an estimated 75 percent of newspapers with a circulation over 50,000.[8] Knight Ridder and the Gannett Corp. are using desktop publishing systems to create and distribute graphic designs nationwide. While major newspapers generally use photocomposition equipment for typesetting in order to get higher print quality, newsletter and some small newspaper publishers frequently find that laser printer typesetting quality is good enough.

The potential implications of desktop publishing for Federal information dissemination seem just as significant. An increasing percentage of Federal information collected, created, and disseminated would appear to be well suited for desktop publishing.

High-End Electronic Publishing

The distinction between desktop publishing and so-called "high-end" electronic publishing is somewhat arbitrary, since microcomputer-based desktop systems can be connected or networked to high-end work stations, typesetters, and printers. Electronic publishing is considered to be the electronic preparation of material at all pre-press stages of the publishing process, including text and graphics preparation, page layout, and composition, with the actual printing in any of a variety of formats—paper, microform, magnetic tape or diskette, optical disk, or direct electronic. In general, high-end electronic publishing is distinguished by:

- high volume (in number of pages and copies),
- high quality (of the final product),
- high complexity (of the page layout and composition), and
- high cost (compared to desktop systems).

High-end systems typically cost $30,000 to $150,000 depending on the configuration, compared to $5,000 to $10,000 for desktop systems. For the software alone, high-end publishing systems typically cost $15,000 to $30,000 compared to $500 to $1,000 for desktop software.

The demand for high-end electronic publishing (and to a lesser extent desktop publishing) is driven by a powerful combination of advantages that translate into significant cost savings and productivity improvements. For example, electronically published materials are generally found to be:

- more attractive,
- easier to read,

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[8] F. Seghers, "In News Graphics, Macintosh Makes the Front Page," *Business Week*, Jan. 19, 1987, p. 87.

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- more timely (publishing time can be anywhere from 25 to 90 percent faster), and
- much less expensive.

Cost savings can be realized in several ways. For example, electronic publishing generally reduces the total number of document pages by 40 to 50 percent, but occasionally up to 80 percent, since typeset pages contain more text than typewritten pages. This can dramatically reduce paper costs for hard copy print runs. For documents with limited demand and low volume, electronic publishing makes printing-on-demand a realistic option. Electronic publishing also facilitates the revision process by minimizing rekeyboarding and graphics redesign.

Various market surveys project a strong demand for electronic publishing over the next 5 years, based on a perceived need for electronic publishing by major corporations and government agencies.

Electronic publishing systems have made rapid technical advances in just a few years. This trend is expected to continue due, in part, to heavy competition among graphics workstations, publishing software, traditional photocomposition services, and computer equipment companies, as well as systems integrators that combine hardware and software from numerous vendors. At the heart of electronic publishing systems is the 32-bit workstation that permits complex manipulation of text, graphics, and, increasingly, halftones. These are the same types of workstations used for computer-assisted design (CAD) and sophisticated graphics applications. This workstation is now an established technology, with a substantial track record. According to Dataquest, 32-bit workstation sales ($15,000 to $50,000 per workstation price range) grew from about 100,000 units in 1983 to 1 million units in 1985, an estimated 2 million in 1987, and a projected 4 million in 1989.[9]

The technical power, sophistication, and flexibility of electronic publishing systems are illustrated by a typical system which uses 32-bit workstations (such as Sun, DEC, or Apollo), a 19-inch monochrome display with a high resolution screen, and a local area network. The typical system can accept input from CAD workstations, scanners, graphics (raster and vector, line art and halftones), spreadsheets, and text (in standard formats compatible with almost any mainframe, mini, microcomputer, or word processor). The system provides output to various laser printers (such as Xerox, Kodak, Imagen, Apple, and Sun) and phototypesetters (such as Linotronic and Compugraphic). Advanced software capabilities typically include:

- integration of text and graphics in nonstructured pages;
- free-form drawing with a mouse;
- tracing tablet to copy drawings;
- editing of digitized line art;
- pixel-by-pixel editing of halftone photographs; and
- simultaneous editing of different portions of the same document.

Overall trends in electronic publishing include the following:

- movement from a fragmented market to an integrated market;
- aggressive competition from electronic publishing systems offered by traditional phototypesetters and by electronic publishing service bureaus;
- standardization of information exchange among different types of hardware and software;
- declining price/performance ratios; narrowing of the technical differences between desktop and high-end publishing systems;
- increasing integration of direct-to-plate printing technologies; and
- increasing speed and quality of performance (including higher resolution, color, and multiple languages).

In the corporate community, investment in electronic publishing is generally claimed to have a rate of return of 50 to 60 percent and a payback period of 2 years or less. Also, companies typically claim to have cut overall publications turnaround time by 50 to 75 percent. While similar data are not yet available from government users, Interleaf Corp. indicates that the following Federal agencies are using Interleaf electronic publishing systems: Defense Advanced Research Projects Agency (for technical reports); Office of Naval Research (for research studies); intelligence agencies (various applications); U.S. Coast Guard (for technical manuals); U.S. Army (for technical manuals); Department of State (for regulations); Department of Agriculture (for statistical documents); Bureau of the Census (for statistical reports); and Federal Reserve Board (for financial analyses). Xyvision reports sales of electronic publishing systems to, among others: the National Center for Health Statistics, National Center for Disease Control, U.S. Geological Survey, Bureau of the Census, and Central Intelligence Agency.

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[9] Cited in G. Lewis, "New Micros," op. cit.

Electronic Forms Management

Another growing application of systems related to electronic publishing is electronic forms management. Several companies specialize in this applications area. The typical standalone workstation, including a processor and hard disk along with software and a high resolution display, costs in the range of $25,000 to $60,000, depending on memory size. The typical system has many of the capabilities of electronic publishing systems discussed earlier, and can be used for designing newsletters, manuals, and technical documents as well as forms.

However, it is not necessary to have full-capability electronic publishing systems for many forms-management applications. For example, among Federal agencies, the Air Force, Army, Navy, Internal Revenue Service, Social Security Administration, Federal Reserve Board, Federal Deposit Insurance Corporation, and National Aeronautics and Space Administration are all using personal computers and laser printers to manage forms. Microcomputers are used to enter the data, and laser printers are used to merge the data with standard forms for printing. The agencies indicate direct savings on the order of 40 percent over preprinted forms.

For larger print runs, even greater savings may be possible where offset printing can be used to reduce the per-page printing cost of about two cents assumed for laser printers. Further savings seem likely since the forms can be stored and edited electronically, minimizing rekeyboarding and redesign. As another example, the combination of microcomputers (or mainframe terminals) and laser printers can be used to permit direct electronic input of data collected by agencies into standard reporting forms stored on the laser printer. The completed forms can be transmitted electronically to a regional office or to Washington, DC, eliminating both cost and potential errors associated with rekeyboarding and the time delays associated with mail delivery. Paper copies can be printed out for archival purposes.

Computer Graphics

Advances in computer graphics are central to the recent breakthroughs in desktop and high-end electronic publishing. Indeed, computer graphics capabilities are key aspects of most electronic publishing systems. And publishing applications have themselves become one of the driving forces for further advances in and broader use of computer graphics. Other driving forces include:

- graphics needs of the scientific community;
- military applications of computer graphics, most recently stimulated by the Strategic Defense Initiative's requirements for very sophisticated, three-dimensional, dynamic computer graphics and modeling;
- continued movement toward graphics standards; and
- continued breakthroughs in price/performance ratios.

Major technical trends in computer graphics include:

- the continuing transition from film-based techniques to digital processing;

- development of relatively low-cost (under $15,000) desktop color scanners and printers;
- further improvements in high resolution graphics (up to 2,000 x 2,000 pixels);
- further development of full color, interactive, three-dimensional graphics workstations at relatively modest prices (e.g., $30,000);
- continued migration of high-end workstation capabilities to low-end workstations;
- and progress in developing standards for exchanging graphics data between workstations, such as the Digital Data Exchange Standard.

Further technical progress in computer graphics seems assured as various companies continually develop new products for top secret military applications. Advanced digitized mapping techniques are used by the Defense Mapping Agency and by various Federal civilian agencies such as the Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and Bureau of the Census. Computerized graphics products can interpret infrared aerial imagery and produce maps. In general, computerized mapping offers advantages similar to computerized printing in that:

- The original map preparation is much faster.
- Maps can be stored electronically to facilitate relatively easy updating.
- The original map and any revisions can be displayed on a video screen.
- Hard-copy output can be obtained relatively quickly with a plotter or laser printer.

Scanners and Printers

Almost all desktop and high-end electronic publishing systems are configured to include one or more printers, and may include one or more scanners. The price/performance of scanners and printers has dropped dramatically in the last few years. Scanners are used primarily to digitize text and images that are initially in paper formats. Scanners are not as efficient as direct electronic input, but are much more cost-effective than rekeyboarding or redrawing those materials not in electronic format.

The cost of scanners has dropped to the point where low-end scanners are available in the $2,000-4,000 price range with a speed of up to several pages per minute and a scanning resolution of 200-300 dots per inch. While satisfactory for many desktop applications, higher speed and resolution are generally needed for high-end publishing purposes. High-end scanners are available in the $15,000 to $40,000 price range with speeds of 1 or 2 pages per second and resolution levels up to 400 dpi. Thus, the high-end scanners achieve speeds and resolutions similar to the high-end laser printers discussed later.

A major advantage of high-end scanners is the capability to approximate graphics-quality halftone pictures. This is accomplished by scanning the image at up to about 120 scan lines per inch and recording multiple bits for each pixel, rather than the one bit commonly used for scanning text and line art. Instead of recording black or white with one bit per pixel, multiple bits permit the recording of the degree of blackness for each pixel, known as gray-scale scanning. Also, many high-end scanners can scan a wide range of type styles and sizes, and some scanners can be programmed to learn new (to the scanner) type styles. These capabilities are expected to migrate to the desktop scanners.

The technical status of printers is more complicated because printers are now used for functions other than printing, such as typesetting, graphics input, and forms management.

For printing of straight textual material, electromechanical line printers (known as impact printers) are efficient for low-copy runs (i.e., one or a few copies per original). Medium performance impact printers can print at about 1,000 lines per minute (20 pages per minute at 50 lines per page) and cost $10,000 to $15,000. High-end impact printers can reach output speeds of about 3,600 lines (72 pages) per minute. Low-end desktop line printers print at a few pages per minute.

The role of impact printers is expected to continue to decline, because of the need for printing graphics and complex page layouts, the use of variable type styles and fonts, and the integration of forms and data at the point of printing.

Non-impact printers (using laser, light emitting diode array, ion deposition, and other technical processes) provide better quality, greater flexibility and diversity, and faster speed (at the high end). While on a per-page cost basis, non-impact printers may be more expensive than impact printers, this is not an appropriate comparison in most cases. When serving as a typesetter or graphics printer or proof printer, the non-impact printer can be an order of magnitude cheaper than conventional methods. For example, for low-volume applications where 300 dpi output resolution is satisfactory, a desktop laser printer at $1,500 to $3,000 may be perfectly adequate for producing camera-ready copy, compared to a phototypesetter at $35,000 to $70,000.

The high-end, non-impact printers are still quite expensive, typically in the $100,000 to $200,000 range although these prices are expected to come down. A typical high-end, non-impact laser printer prints at 90 to 120 pages per minute. By comparison, a desktop laser printer prints a few pages (e.g., 3 to 6) per minute and costs as low as $1,500. At the next level up, a typical mid-range laser printer might print at 12 to 20 pages per minute and cost $10,000 to $15,000. Again, price/performance ratios continue to fall.

Non-impact printers are not well suited for jobs requiring high output quality and/or print volume. With respect to quality, most non-impact printers can achieve an output resolution of 300 dpi (assuming that the input resolution is at least at that level). This output quality is adequate for a wide range of purposes, but not for high-quality publications. By comparison, photocomposition equipment can produce typeset output at resolutions of 1,200 or more dpi. Technical advances are reducing this quality differential. Indeed, 400 to 1,000 dpi laser printers are now on the market. High resolution non-impact printers are adequate to meet many electronic publishing needs, either for demand printing or as camera-ready copy to be used in subsequent plate-making and photo-offset printing. Continued technical advances and market forces are likely to push the typical output resolution of laser and other non-impact printers into the 600 to 800 dpi range over the next few years, thus further closing the quality differential.

With respect to print-volume requirements, it is still far cheaper to use conventional photo-offset printers for high-volume print runs than laser and other non-impact printers. One can debate the various break-even points as a function of the length, format, number of copies, and desired turnaround time for specific documents. In offset printing, plate-making (preparation of masters or negatives of the original images by which ink is transferred onto paper to make copies of the original) costs anywhere from a few dollars to $50 and up per page. This cost indicates that non-impact printing is frequently less expensive for short print runs of under a few hundred copies per original. For larger print runs, the printing cost is likely to be cheaper with photo offset rather than laser printing.

It appears that the cost of non-impact printing (including xerographic) is rarely below 2 cents per page. Thus, assuming $2 per page for plate-making (this is for desktop relatively low volume applications), and assuming all other costs are equal (purchase or lease, maintenance, supplies, and labor), the break-even point would be about 100 copies. In this hypothetical and oversimplified case, print runs under 100 copies per original would use a non-impact printer and print runs over 100 per original would use a photo offset printer. Other elements besides cost may enter into the printing decision, such as quality, speed, turnaround time, and control. In the future, the break-even point between non-impact and photo-offset printing will depend in part on their relative technical advances and cost reductions.

ONLINE INFORMATION DISSEMINATION

Online Information Retrieval

Previous discussions have focused on a number of electronic information technologies—microcomputers, page composition and publishing software, computer graphics, scanners, printers—with the information maintained in electronic form through many or all stages of the publishing process. The primary final output has been in paper format. Advances in technology make it possible to disseminate the output information in a variety of electronic formats as well as paper. For some purposes and some kinds of information, electronic formats may be preferable to paper. This is especially so for bibliographic, reference, statistical, and bulletin board information where the user may not want to see the whole document, but is only interested in locating specific pieces of information. The private sector information industry has given high priority to computerizing access to these types of information, whether the original source of the information is the government, academic, research, or commercial sectors.

This section discusses the technology and application of online information retrieval systems in the context of the private sector, since this is where much of the online activity is occuring. From a technical viewpoint, these private sector applications are directly relevant to the Federal Government.

The technology of online information retrieval is well established. Customer access is typically via a microcomputer or terminal connected to a modem. Residential customers normally tie into the local telephone company network (e.g., Bell Operating Companies, independent telephone companies) and, if accessing a database from long distance, then connect to an interexchange carrier network (e.g., AT&T, MCI, U.S. Sprint) or a value-added network (e.g., Tymnet, Telenet). Business customers can sometimes bypass the local telephone company and connect directly to an interexchange or value-added network. At the other end, access to the desired database is frequently via an online database services company (e.g., Lockheed DIALOG, Pergamon Infoline) or a database gateway company (such as is available from Western Union's EasyNet). Gateway companies serve as intermediaries between the customer and the database source and do not maintain the database itself. Online database service companies actually maintain copies of the databases online, so that referral to the database source is not necessary. Some database source companies do provide for direct customer electronic access to the database, without going through a gateway or online services company. Companies that maintain online databases need:

- a host computer and memory necessary for handling the volume of data and frequency of use, and
- the necessary front-end processor and communications equipment for handling remote inquiries and transmitting responses.

The growth of the online information industry has been phenomenal. From less than $500 million in annual revenues in 1978, the industry has grown to about $2 billion total revenues in 1986, $3 billion in 1987, and is projected to reach about over $4 billion by 1990.

A typical commercial online database service charges about $40 to $80 per hour, of which about 40 to 45 percent is for acquiring and preparing the actual data, and another 40 to 45 percent is for sales, marketing, and administration. About 6 to 9 percent is for communications (including the cost of customer premises equipment, e.g., computer terminal and modem, local exchange access, and interexchange link if applicable), and about 6 percent is for data processing (including the cost of hardware and software for database storage and data communication).[10]

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[10] Studies by Cuadra Associates and Elsevier Science Publishing cited in P.W. Huber, *The Geodesic Network: 1987 Report on Competition in the Telephone Industry*, prepared for U.S. Department of Justice, Washington, DC, January 1987, p. 7.13.

One implication of the above cost structure is that substantial savings can result to the extent that the data are already in the appropriate electronic format. If as a result of electronic publishing government statistical or reference reports were produced in electronic form as a matter of course (even if the ultimate product is in paper format), then the electronically formatted information could, at least theoretically, also be made available as an online database. This could significantly reduce the cost of data acquisition and preparation. This is a major cost element, regardless of whether the government and/or commercial firms disseminate the data. Sales, marketing, and administrative costs may not be as amenable to reduction for commercial firms, unless they are working under contract to the government in such a way that the market was, in effect, guaranteed. For the government, distribution to information intermediaries (e.g., libraries in the depository program) might help reduce marketing and other costs. Technology is only a small part (perhaps less than 15 percent) of the cost of online databases.

Telecommunications

Online information retrieval services and several other kinds of electronic information dissemination (e.g., electronic mail and facsimile) are dependent on telecommunication technology and systems. A number of developments are converging to facilitate and most likely reduce the relative cost of data communication. One key trend is the transition from analog to digital telecommunication networks that are designed to transfer information much more efficiently than the conventional analog telephone networks. A second trend is the rapid movement towards national and international standards for data networks of all kinds. A third trend is the maturation of Ku-band satellite, fiber optic, and FM subcarrier technologies for data transmission.

The implementation of FTS 2000, the upgraded Federal Telecommunication System, is intended to make state-of-the-art data communication capability available to all major Federal agencies. As currently planned, FTS 2000 will include:

- switched voice (up to 4.8 kilobits/second transmission capacity);
- switched digital integrated service;
- packet-switched services;
- video transmission (including graphics, facsimile, limited and full motion video); and
- dedicated voice or data transmission circuits.

The switched digital integrated service and packet-switched service should be especially useful for online database retrieval or electronic document transmission. The switched digital integrated service is designed to be the equivalent of the Integrated Services Digital Network (ISDN) for digitally integrating voice, data, images, and video over the same transmission medium. As planned, the FTS 2000 version will be consistent with ISDN international standards and will have a 1.544 megabit/second transmission capacity subdivided into 24 individual channels of 64 kilobits/second each. For illustrative purposes, one 64 kilobit/second channel can transmit about four pages of text per second (at 250 words per page x 8 characters per word x 8 bits per character). The planned FTS 2000 packet-switched service will be consistent with international standards for open systems interconnection and interoperability with public data networks and public electronic mail services. The FTS 2000 packet-switched service is planned as a 24 hours a day, 7 days a week operation with 99.5 percent uptime and 98 percent availability.

The basic concept of packet-switching is that data can be transmitted most efficiently when assembled into packets (or bunches) of bits of information. The U.S. packet-switching volume for 1985 has been estimated by International Resource Development at about 47 million kilopackets, of which 7 million kilopackets were for database access, 3 million for electronic mail, and 0.3 million for electronic data interchange.[11] Typical commercial rates for packet-switching have been estimated at about $0.50 per page of text for local packet-switching and roughly 3 times that for national packet switching.[12] While these rates compare favorably with electronic mail and may be acceptable for very short documents, the cost of packet-switching long documents would be quite high. Whether FTS 2000 will significantly reduce packet-switching costs in unknown at this time.

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[11] Cited in P.W. Huber, *Telephone Industry*, op. cit., table PA.1.

Data transmission networks of all kinds are expected to incorporate both satellite and fiber optic technology wherever appropriate. For example, a high speed (56 kilobit/second) packet-switched data transmission network can incorporate both a fiber optic terrestrial component and a Ku-band (12-14 gigahertz) satellite component. The Ku band permits use of lower-cost, very small aperture (VSAT) earth stations with receiving disks that are 1.2 or 1.8 meters in diameter. Such a system could be used for such functions as transmitting data collected from remote locations.

Over the next few years, a balanced network of satellite and fiber optic transmission links is likely to evolve. Fiber optic links are likely to be used primarily for heavy volume, point-to-point transmissions, while satellite links are expected to dominate for point-to-multipoint transmissions. Experimental tests of fiber optics have attained transmission rates of 4 billion bits/second over relatively short distances. By comparison, this is more than a 1,000 times the 1.544 megabits/second transmission capacity specified in the ISDN standard, and is equivalent to transmitting an entire 30-volume encyclopedia in 1 second.

The integration of fiber optics with satellite, microwave, and copper wire circuits will be facilitated by the continuing development of teleports, with respect to traffic between major U.S. metropolitan areas and overseas traffic. Teleports are essentially buildings and facilities that serve as a platform or bridge for interconnecting different modes of telecommunication all at one location.

The trend towards so-called intelligent buildings will facilitate integration across different telecommunication technologies and services. Intelligent buildings are prewired during construction with local area networks (LANs) capable of handling digital data communication. LANs can carry information much faster and more efficiently than the conventional telephone and PBX (private branch exchange) analog circuit and switching systems. The cost of LAN installation is much reduced if completed during building construction rather than retrofitted. The trend toward intelligent buildings is expected to accelerate in response to the rapid increase in networking of microcomputers, mainframe terminals, peripheral equipment (including scanners, printers, and graphics workstations), and the like in the office environment.

A final telecommunication technology to be discussed in this section is FM (frequency modulated) radio subcarrier transmission. The FM subcarrier is an excess portion of the bandwidth assigned to FM radio stations, and was deregulated by the Federal Communications Commission in 1983. The FM subcarrier appears to be cost-effective for point-to-multipoint transmission of time-sensitive digital data traffic, such as news and public affairs information. For example, MultiComm Telecommunications Corp. (Arlington, VA) is using Western Union's Westar IV satellite to transmit information to 90 participating FM radio stations, where the information is in turn retransmitted on the FM subcarrier to receiving sites equipped with a special, low-cost FM receiver. The information can be stored on a microcomputer or printed out. MultiComm sells the receiver/printer for $500 or leases the equipment for a nominal fee of $25/month. The costs of the service per receive site range from 20 cents per page of information transmitted for immediate delivery (e.g., within 19 seconds), 10 cents per page for delivery within 2 hours, and 5 cents per page for overnight delivery. This is far cheaper than courier service, especially for shorter documents. The 90 participating FM stations broadcast to an estimated 85 percent of the U.S. population. Ku-band small satellite earth stations could be used to reach rural and remote areas. MultiComm offers a Federal News Service that transmits transcripts of White House briefings, congressional testimony, and the like to hundreds of newspapers and trade associations, and an Infowire service for low-volume users who need time-sensitive information on, for example, White House and agency press releases, advance schedules of upcoming hearings, and the like. Other private firms are using the FM subcarrier to distribute such information as stock market quotes.

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[12] Ibid., table PA.2 and accompanying text.

Electronic Mail

Another technical option for online information retrieval and two-way information transfer is electronic mail. As discussed previously, electronic mail capability is planned as part of the FTS 2000 system. Electronic mail has grown more slowly than initial expectations, but appears to be reaching a critical threshold of viability.

The outlook for electronic mail is being enhanced by several key trends:

- Electronic mail is increasingly included as a basic capability of office automation systems, such as those offered by Data General, DEC, IBM, Wang, and NBI;
- Vendors are providing much improved capacity for interconnections or gateways between electronic mail systems (e.g., Wang and IBM, DEC and MCI Mail, IBM and Western Union EasyLink, MCI Mail and CompuServe EasyPlex);
- Enhanced electronic mail capabilities are being developed that can handle graphics and spreadsheets besides American Standard Code for Information Interchange (ASCII) text; and
- There is growing acceptance of the CCITT (Consultative Committee on International Telephone and Telegraph) X.400 standard for electronic mail and message-handling service. X.400 is based on the OSI (Open Systems Interconnection) model and will permit interconnection among various electronic mail services.

Many electronic mail systems require a modem (modulator/demodulator) at each end of the circuit, to convert the digital signals from the sending computer into analog signals for transmission over the telephone lines (at least in the local exchange) and back again from analog to digital at the receiving computer. However, modems are likely to be less of a constraint in the future for at least two reasons. First, the cost of modems continues to drop—a 300 bits per second modem now costs $100 to $200, a 1,200 bps modem (the de facto standard for remote computer networking including electronic mail and bulletin boards) $200, and the higher speed 2,400 bps modem about $300 to $400. Second, in the future, all-digital data communication and telephone networks will eliminate the need for modems almost entirely. Modems will be necessary only to the extent analog phone systems are still used.

The cost of electronic mail varies according to the length and the volume of the messages and the type of electronic mail system used. For an inhouse personal computer or office automation-based electronic mail system, the cost range has been estimated at roughly $1 to $2 per 3-page message (7,500 characters) at a monthly volume of 1,000 messages, and is estimated to drop to about $0.10 to $0.20 per 3-page message at a monthly volume of 10,000 messages. By comparison, electronic mail service bureaus typically charge in the range $1 to 3 per 3-page message regardless of volume.

Other alternatives for transmission and receipt of electronic mail include: electronic bulletin boards, digital facsimile services, and videotext services. For discussion of these and other related telecommunication technologies, see *Communication Systems for An Electronic Age* (OTA, forthcoming, 1989).

OPTICAL DISKS

For information that neither changes frequently nor requires immediate, online remote access, optical disk technology is a viable technical option for purposes of information storage and dissemination and as an important component of electronic publishing systems. (Other optical technologies not discussed here, such as optical or laser cards on strips, could provide storage and dissemination of smaller amounts of information.) While some standards issues still need to resolved, the significant technical advantages of optical disks are becoming more and more evident as a result of numerous development applications, prototype tests, and, commercial offerings.

Optical disk technology uses a laser beam to record data on plastic disks by engraving pits in the surface. The disks can then be subsequently read by a low-power laser beam to retrieve the data. There are several different types of optical disk, and some are further along in terms of technology and standards than others. Standards are essential for optical technology to ensure compatibility among different types of disks and disk readers, and to minimize the possible need for future rerecording of data due to incompatible equipment.

The major advantage of optical disk technology is the ability to store and disseminate large amounts of information at very low cost. For example, a 4.72 inch (12 centimeter) CD-ROM (Compact Disk-Read Only Memory) can store up to roughly 540 megabytes (millions of bytes) of data. Assuming that one typewritten text page averages 250 words or about 2,000 bytes per page, one CD-ROM can store up to 270,000 pages of typewritten text. Grolier has recorded its entire 20-volume Academic American Encyclopedia on about one-fifth of one disk. One floppy diskette (single-sided, single density) can store about 360 kilobytes of data, which is equivalent to about 180 pages of double-spaced typewritten text. Thus, 1 CD-ROM can store the equivalent of about 1,500 floppy diskettes, about 54 of the 10-megabyte hard disks, or about 10 of the 1,600 bits-per-inch magnetic computer tapes. A 12-inch (30 cm) WORM (Write Once Read Many times) optical disk can store up to 1 gigabyte (billion bytes), which is roughly double the capacity of a CD-ROM. All of these storage capacities are per single side, and would be doubled for two-sided disks.

The total and per bit or byte manufacturing costs of both 4.72-inch CD-ROMs and 12-inch WORM optical disks are already quite low. CD-ROMs can be mastered for $4,000 to $5,000 and can be reproduced in quantities ranging from $30 per disk for 100 copies to $6 per disk at volumes of several thousand. Some estimates suggest per disk costs as low as $3 for volume runs. The 12-inch WORM disks are more expensive to produce, at about $150 a copy, but are still far cheaper per byte than floppy diskettes or hard disks. These costs do not include the cost of data acquisition and preparation, which apply to any storage medium, and the cost of equipment needed to read the disks. All that is necessary to read CD-ROMs is a CD-ROM reader, available from several vendors in the $500 to $1,000 price range, and a personal computer and screen. Thus, for users already owning a microcomputer system, the incremental cost of CD-ROM equipment is in the same range as the medium to high-end consumer-oriented compact digital audio disk players. WORM readers are considerably more expensive—several to tens of thousands of dollars range—although this can be modest for the institutional (corporate and government) users who are the likely clients for 12-inch WORM disks.

Optical disks also offer other advantages:

- rapid access to stored data (i.e., in one second),
- the ability to use a microcomputer for data access and retrieval,
- high levels of data integrity,
- very minimal disk or equipment wear,
- convenience and portability, and
- relatively long media life.

The latter point is somewhat controversial as initial manufacturer estimates of 10 to 20 years have now been extended to 40 to 50 years. Some suggest that 100 years is possible under ideal conditions. Disks could be recopied at periodic intervals if necessary.

The high level of commercial and governmental activity is indicative of the potential for CD-ROM and WORM disks. Vendors (such as Lockheed DIALOG, Cambridge Scientific Abstracts, Alde Publishing, and VLS, Inc.) are offering many new optical disk-based products and services. Many of these include databases that originate in whole or in part from the Federal Government.

Federal agencies are actively pursuing a wide range of development and prototype projects. For example:

- The Nuclear Regulatory Commission (in cooperation with the Smithsonian Institution) is developing a WORM optical disk system to keep track of submissions regarding nuclear waste disposal under the Nuclear Waste Policy Act of 1982. The system uses personal computers, scanners, and 12-inch WORM optical disk drives.
- The Library of Congress is prototyping optical disk technologies for general research, archival, and information retrieval purposes, including the use of a 100-disk optical jukebox for 12-inch WORM disks. The jukebox has a potential storage capacity of 200 gigabytes.
- The National Library of Medicine is prototyping various optical disk technologies for medical applications, research, archival, and instructional purposes.
- The Bureau of the Census is prototyping the use of CD-ROMs for storing and distributing maps that will result from the 1990 census. The Census Bureau is also examining the potential of CD-ROM for a broad range of geographic and topographic maps as part of the Topographic Integrated Geographic Retrieval (TIGER) project being conducted jointly with the U.S. Geological Survey.
- USGS is prototyping the use of CD-ROMs for the possible goal of providing all (or a large part) of USGS earth science information in CD-ROM format such as seismic data from the National Earthquake Information Center. USGS officials believe that CD-ROM offers the potential to make earth science data much more accessible at lower cost.
- The U.S. Navy's Printing and Publications Service is implementing a print-on-demand system for 1.2 million pages of military specifications and standards, including text and graphics images. The Navy is using a 12-inch WORM optical disk unit to record the disks, which are then placed on two 32-disk juke boxes. More frequently requested documents are concentrated on a few disks, and output is printed with Xerox 9700 laser printers. The system is intended to:

  —reduce warehouse space and printing costs,
  —improve response time,
  —eliminate dissemination of out-of-date documents, and
  —serve as a prototype for many other applications—for example, technical manuals, training materials, and handbooks.

  The Navy intends to develop interactive applications for document updating, alternative storage media (such as CD-ROM and 5.25-inch WORM optical disks), and document search capability.
- Other Federal agencies actively pursuing optical disk technology include the: Internal Revenue Service, Patent and Trademark Office, National Archives and Records Administration, National Aeronautics and Space Administration, Central Intelligence Agency, and numerous components of the Department of Defense including the National Security Agency.

Another popular optical disk technology is the analog videodisk. This is heavily used for educational and training purposes, and can store up to 54,000 images per disk. Videodisks are roughly similar to CD-ROMs in cost—about $2,000 to master, $18 per disk for the first 100 copies, and under $10 per disk for runs of several thousand. Videodisk readers cost in the range of a few hundred to a few thousand dollars.

Beyond the CD-ROM, WORM, and videodisk, there are several other optical disk technologies under active development and application. The most noteworthy are: the CD-I (Compact Disk-Interactive) that combines text/data, video, audio, and software storage, editing, and retrieval on one disk; and the erasable 12-inch or 5.25-inch optical disk. CD-I is of particular interest because it will make possible such compact disk applications as: talking CD books, "smart" CD books (using expert systems), CD book (or library) of the month, and interactive audio, video, and database software. CD-I will be a disk with powerful capabilities including:

- graphics (e.g., digital video still frames, limited motion video, encoded colors, full screen animation);
- audio (e.g., digital audio, hi-fi, mid-fi, speech quality); and
- text (e.g., bit-map text storage for display only, character-encoded text for editing/processing).

Optical disk technologies and applications continue to advance at a rapid pace. Double sided 12-inch WORM disks are now available with up to 4 gigabytes storage capacity per disk. The initial commercial 5.25-inch erasable disks already have been introduced, and CD-I disks now are in the prototype stage, with commercial introduction expected in 1989 or 1990. Some vendors have expanded the capacity of CD-ROM disks up to 750 megabytes, and others offer CD-ROM juke boxes that can access up to 240 disks. Personal computer compact disk readers are entering the market, as are specialized PC-CD/ROM applications (e.g., using hypertext or hypergraphics software). A fledgling CD-ROM service bureau industry is developing, not far behind and perhaps eventually to be integrated with the electronic publishing service bureau industry.

A major critical path item for optical disk technology is the development of standards. The current status and outlook are briefly discussed in a later section, along with consideration of other standards issues.

EXPERT SYSTEMS

Expert systems, sometimes known as knowledge-based or rule-based systems, are typically computer software packages that permit users to have the benefit of expert knowledge in specified subject areas. The "expert" in expert system means that both the knowledge and rules (decision paths and criteria) built into the software come from relevant subject matter experts. Expert systems have advanced to the point where widespread application to many aspects of information dissemination is likely—ranging from technical writing to information access and retrieval to the management of electronic publishing.

The expert systems applicable to information dissemination are no different in principle from the systems that have been successfully applied to various scientific, industrial, and educational areas. For example, expert systems have been used to:

- help make agricultural management decisions regarding pest control as a function of the type of crop, landscape, weather conditions, season, other vegetation, infestation history, and the like;
- help students explore and master a subject or skill and even monitor the learning progress of the students (known as "electronic or intelligent tutors"); and
- help technicians interpret technical data from computer-assisted manufacturing systems.

Expert systems can be tied into both online bibliographic and full text information retrieval and to electronic publishing. For example, prototype expert systems with sophisticated search strategies are being used to retrieve and deliver full text information via electronic publishing systems. These kinds of information retrieval expert systems could eventually work hand-in-hand with expert systems designed to efficiently manage electronic publishing. One can easily envision the day when expert systems will help optimize the electronic publishing and dissemination (paper and electronic) of information products (or packages of products), given the specific profile of the product (number of pages, composition, type style, use of graphics, etc.), anticipated user needs (e.g., size of demand by format), and the mix of dissemination channels (initial press run of paper copies, provisions for demand printing, online database access, optical disk distribution, etc.).

Numerous expert system applications for information search and retrieval are under development. For example:

- The National Records and Archives Administration (NARA) developed a prototype expert system to assist with routine inquiries from researchers. The objectives of the project were to evaluate the capability of an expert system to capture the expertise of experienced archivists and to relieve them of the significant expenditure of time needed to answer routine inquiries. Test results indicated that if the prototype system were expanded to full scale, the system could be expected to agree with its human counterpart more than 90 percent of the time. NARA plans to extend testing of expert systems to other areas of records management.
- The Defense Technical Information Center has established an Artificial Intelligence/Decision Support Laboratory that is working to apply the full range of expert systems and even more powerful artificial intelligence technologies to information access and retrieval. The ultimate objective is to facilitate the capture and transfer of knowledge from the experts to the users of DTIC (and other DoD) information systems, utilizing innovative information display techniques and full integration with the DoD Gateway Information System that is interfaced with hundreds of online databases.
- The National Agricultural Library (NAL) has developed prototype expert systems that query users on their information needs and route them to the appropriate bibliographic sources. The prototype was provided to over 700 librarians in a floppy disk format that runs on a microcomputer. NAL hopes to create a critical mass of expert system users, and believes that expert systems could help free librarians from the more routine ready reference and directional questions. NAL is also exploring linking expert systems to other government and commercial online databases and CD-ROM players. Expert systems could be used to query the user on his or her information needs, help sharpen the request, and then route the request to an online bibliography, a disk-based bibliography, or a full text document on videodisk or CD-ROM with electronic printing on demand. The possibilities are almost endless.

TECHNICAL STANDARDS

The pace of development and application of several of the technologies discussed earlier is dependent on the development of and agreement on national and international standards. Standards-setting efforts are underway in all critical areas, although the intensity of activity varies. The major standards organizations include:

- the International Committee on Consultative Telephone and Telegraph (CCITT), which is a unit of the International Telecommunications Union and whose formal members are 160 governments;
- the International Standards Organization (ISO), whose members are the national standards bodies of 89 countries;

- the American National Standards Institute (ANSI) that represents the United States in the ISO and coordinates voluntary standards activities in the United States;
- the National Bureau of Standards (NBS), which is the lead U.S. government agency in many standards areas; and
- the Federal Communications Commission with respect to certain telecommunication standards.

A new organization, the Corporation for Open Systems (COS), was established in 1986 to promote open systems interconnection standards. COS members are primarily telecommunication and information equipment and services companies.

The following discussion highlights standards-setting for optical disks, page description languages, and test markup languages. For discussion of other standards areas (e.g. electronic data interchange, integrated digital services), see *Communication Systems for an Information Age* (OTA, forthcoming, 1989).

With respect to optical disk standards, the two leading manufacturers of optical disks—Sony and Phillips—took the lead and developed a set of proposed standards for CD digital audio, CD-ROM, and CD-I, known as the Red Book, Yellow Book, and Green Book standards, respectively. The proposed CD-ROM standards (Yellow Book) included detailed technical specifications for CD encoding, mastering, replication, decoding, and reading, such that any CD-ROM disk can be read by any CD-ROM disk drive, and have become de facto industry standards. In addition, standards for the logical formatting of CD-ROMs were initially proposed by the so-called High Sierra Group and subsequently adopted by ISO as an international standard. Data preparation is the one area not fully specified by the proposed standards. While data must be logically organized, formatted, and prepared prior to conversion into optical disk format, the standard permits use of a wide range of computer operating systems. Although the other specifications insure that disks are physically readable by any disk drive, the data may not be accessible except through proprietary software. However, this approach is consistent with the usual industry practice for disk drive standards. Standards for WORM, Erasable, and CD-I disks are in earlier stages of development.

Another very important standards area involves the page description and the text markup languages used to code the format, style, and composition of documents. If the text markup language used to prepare a document is not compatible with the language used by the composition and/or output devices, then significant additional work is required to strip the markup commands from the document and reinsert the commands in a compatible language. Sometimes it is easier just to rekeyboard and recode the entire document, at significant additional cost. Alternatively, a page description language can be used to make the conversion automatically, if there is page description software compatible with the particular text markup language and output devices in use.

One possible page description language is the PostScript language (by Adobe Systems) that is becoming a defacto standard at least for desktop and WYSIWYG publishing systems due to the fact that both Apple and IBM, among others, use PostScript. This possibility is under consideration by NBS, ANSI, and ISO. A related effort involves the development of a Standard Page Description Language (SPDL). These approaches are intended to match the applications software (e.g., for editing and composition) to the output devices and eliminate the need for the so-called device driver which is a separate set of instructions needed to make the applications software communicate with the output device.

Text markup standards are particularly important to realize the full benefits of electronic information dissemination. If government documents (whether reports, pamphlets, manuals, other text, or text plus tabular and graphics material) are not prepared in a standardized electronic format using standardized codes and descriptors, substantial recoding and rekeyboarding may be necessary at later stages of the dissemination process. Any significant recoding and rekeyboarding is costly and can offset some or all of the cost advantages of electronic formats.

Text markup standards are intended to establish a consistent set of codes for labeling key elements of a document—such as chapter titles, paragraph indentations, tabular presentations, and the like. Such standards establish a logical structure for the elements of a document, in a hierarchical order—such as chapter, paragraph, line, word, and character. The elements are assigned codes (which can be a letter, number, symbol, or combination thereof) that are keystroked along with the text, tables, and graphics included in the document. If these electronic codes are widely agreed upon and used (i.e., standardized), then the documents can be electronically transferred from one stage in the dissemination process to another with little or no additional effort.

A wide range of information dissemination functions would be facilitated by text markup standards, including:

- authoring
  - —creating the document
  - —editing
  - —revising
- archiving
  - —short-term
  - —long-term
- disseminating in multiple formats
  - —conventional printing
  - —electronic printing-on-demand
  - —online electronic
  - —offline electronic (e.g., magnetic tape, floppy disk, CD-ROM)
  - —microform
  - —specialized outputs (e.g., braille, foreign languages, voice)
- disseminating through multiple channels
  - —agency clearinghouses and information centers
  - —governmentwide clearinghouses and sales programs
  - —press, libraries, and commercial vendors

For example, text markup standards would help ensure that NTIS and/or GPO are able to efficiently reproduce and disseminate agency electronic documents. This would also facilitate private vendor repackaging or enhancing of agency documents, if the vendors utilized the same standards.

Three major approaches to text markup standards are: 1) GPO's logically structured full text database standard; 2) the Standard Generalized Markup Language (SGML) that has been adopted by the Department of Defense; 3) and the Office Document Architecture standard.

The GPO standard is used almost exclusively by GPO, congressional committees and offices, and Federal agencies—primarily those agencies that submit magnetic tapes to GPO for typesetting and printing. Full text database standard or specification is the application of a logical coding structure to the full text or content of the document, including tables as well as text. GPO staff recently completed training on how to write software programs that can translate from SGML to GPO's full text database standard. GPO indicates that it is prepared to write such software at customer request. The GPO standard is designed primarily to meet the needs of publishing professions. SGML, on the other hand, while also meeting publishing needs, is recognized as an international standard, endorsed by DoD and some vendors, and is being issued by NBS as a Federal Information Processing Standard (FIPS). SGML is a set of rules for developing the element codes for a document, whereas the GPO standard includes both the rules and the specific codes themselves. Both SGML and GPO use a logical structure, so in principle SGML codes should be convertible to GPO's codes, and perhaps vice versa, although some of these applications are still under development.

Office Document Architecture (ODA), a related protocol, is directed primarily to meeting office, not publishing, needs, and thus the document complexity is reduced (due to fewer fonts, formats, etc.). ODA is a method of encoding software that essentially converts documents to a common code compatible with a wide range of office automation systems. ODA is a protocol for converting the codes used to format individual documents into a common format for the interchange of the documents among different systems. ODA was initially defined by the European Computer Manufacturers Association (ECMA) to be consistent with the Open Systems Interconnection standard developed by the ISO and has been issued as an international standard. Officials at NBS believe that there may be a need for both ODA and SGML standards within the Federal Government.

Finally, there is intensive work by all major standards organizations to refine and implement the open systems interconnection (OSI) concept. An OSI reference model has been developed under ISO auspices. The model services as a master standard for an integrated telecommunications-information systems environment. It also incorporates already established standards such as those for packet-switched data networks and electronic mail. Many vendors and users have recognized the need for rapid OSI implementation. In the United States, NBS is coordinating an OSI prototype system known as OSINET that is intended to be a test of the OSI reference model. The results are being made available to the standards-setting organizations.

The Federal Government commitment to OSI is already significant, with a growing consensus that OSI is necessary to move to interoperability of the now confusing and largely incompatible range of equipment and software in the government inventory. Indeed a Federal interagency committee has recommended that OSI standards be mandatory for new Federal computer and telecommunication procurements and be a first option for retrofits of existing systems. The suggested OSI procurement standard would be consistent with the ISO reference model. This OSI procurement standard is being issued by NBS as a Federal Information Processing Standard (FIPS).

Chapter 4

Alternative Futures for the Government Printing Office

Clockwise from top left: a hot type scene at GPO, circa 1940s; GPO operator using electronic photocomposition equipment; GPO operators using keyboard input terminals, and the *Congressional Record* coming off the press (photo credit: U.S. Government Printing Office).

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Chapter 4

Alternative Futures for the Government Printing Office

SUMMARY

This chapter along with chapter 5 examines in detail selected alternatives for the future of the U. S. Government Printing Office (GPO) and National Technical Information Service (NTIS). Chapter 4 focuses on GPO, and chapter 5 on NTIS and NTIS/Superintendent of Documents (SupDocs) cooperation. The intent is to gain a full understanding of the strategic outlook for both GPO and NTIS as an input to congressional decisions on their future direction. This strategic outlook should be relevant to congressional consideration of any alternatives for GPO and NTIS, not just the ones explicitly discussed here, and should be read in the context of the trends discussed in chapters 2 and 3 of this report. The results of this strategic analysis are highlighted below. Policy implications are discussed in chapters 11 and 12.

First, General Accounting Office (GAO) surveys of Federal agencies (chapter 2) and Federal information users (this chapter), coupled with a review of agency automation plans and activities, suggest the following overall projections:

- 1 to 3 years—steady state in demand for paper formats; rapid growth in electronic formats, but still a very small percentage of total demand;
- 3 to 5 years—demand for paper formats may start to decline; demand for electronic formats likely to reach critical thresholds for several types of Federal information;
- 5 to 10 years—demand for paper formats likely to decline markedly in some categories, but would still be significant for traditional government books, reports, and publications; electronic formats likely to dominate for many types of information.

On one hand, near-term (1-3 years) future demand for traditional GPO services is likely to be stable, absent a severe governmentwide fiscal crisis and assuming executive agencies continue to be required to obtain printing from or through GPO. GPO's greatest assets are its traditional ink-on-paper printing facilities and experienced labor force, coupled with a substantially automated prepress capability, including electronic input, photocomposition, and typesetting. GPO has invested heavily over the past decade in upgraded prepress, press, and bindery facilities. Despite the possibly misleading external appearance, the GPO main plant compares favorably with even the largest and best equipped commercial printing plants.

On the other hand, GPO is particularly vulnerable in the medium-term (3-5 years) to changes in demand for paper formats that might reduce executive agency need for GPO procured printing (which accounts for about three-quarters of GPO's total printing work) and for GPO main plant inplant printing (where the bulk of GPO overhead and labor costs are located). The future of GPO printing depends in large measure on the plans and activities of Department of Defense (DoD) agencies, that collectively account for roughly one-third of all GPO billings. The defense agencies are determined to reduce drastically their dependence on paper formats within the next few years. If traditional ink-on-paper defense work was phased out, almost all of the GPO regional and satellite procurement offices would lose at least half and some over 90 percent of their work, and two of the GPO regional printing plants would lose perhaps one-third to one-half of their work. Realistically, the defense conversion from paper to electronic for-

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mats could take longer than planned, but warrants careful monitoring due to the highly leveraged effects on the GPO regional work load. The GPO main plant is not dependent on military work, but is vulnerable due to the combination of potential electronic competition for some major product lines (such as the *Congressional Record* and *Federal Register*) and a high overhead cost structure necessitated largely by GPO's current diversified responsibilities.

In the hypothetical case that GPO were to be limited to legislative branch printing (plus some key governmental process work such as the *Federal Register*, passports, and postal cards), the main plant printing operations would switch from a net surplus of several million dollars to a net loss of several tens of millions of dollars, assuming no changes in demand and overhead, cost, and labor force structure (other than those associated with transferring the GPO printing procurement program to an executive agency such as the General Services Administration (GSA)). Restoring GPO to breakeven operations under this scenario could necessitate up to a 40 percent reduction in the main plant labor force and/or a significant increase in rates.

GPO is faced with several challenges and opportunities concerning electronic publishing and dissemination of electronic formats. Federal executive agencies are rapidly increasing their automation activities, and have already invested, collectively, an estimated $400 million in electronic publishing systems. GAO surveys found dramatic increases in the percentages of both agencies and information users that anticipate use of electronic formats (especially online data bases, electronic mail or bulletin boards, floppy disks, and compact optical disks) over the next 3 years.

For the executive branch, several roles for GPO are emerging beyond the continued provision of traditional printing services. GPO could:

- continue to improve cost-effectiveness at the input and prepress end of the printing process by encouraging electronic submissions, already at high levels, and dial-up composition services where appropriate;
- encourage adoption of governmentwide structured database standards for electronic (as well as conventional) printing;
- facilitate mechanisms for training and education about electronic publishing;
- establish an electronic publishing laboratory and innovation center, open to agency personnel; and/or
- increase SupDocs dissemination of electronic formats.

Up to now, GPO has participated in only a handful of agency automation programs. **From a strategic perspective, GPO would benefit from staying abreast of agency applications and, thereby, be in a much better position to identify opportunities to meet agency needs. In a decentralized and competitive electronic information environment that increasingly characterizes the Federal Government, GPO will have to be innovative in matching its expertise to agency needs that are likely to vary widely and change at an increasingly rapid pace.**

For the legislative branch, GPO already has a central role in many traditional publishing activities and several electronic publishing pilot projects. GPO could develop plans for an expanded role for congressional committees and offices, including electronic search, retrieval, and printing-on-demand of congressional documents. Any detailed planning would need to take into account the related roles of the Library of Congress and Congressional Research Service, House Information Systems Office, and Senate Computer Center.

With respect to GPO SupDocs sales of electronic formats, SupDocs would be operating in a more competitive environment than has traditionally been the case with respect to paper formats. For many types of Federal information, individual agencies and/or private vendors might decide to market electronic formats. SupDocs would need to decide which electronic items would be cost-effective and competitive if included in the sales program.

Three policy issues would need resolution.

- First is that significant SupDocs sales of magnetic tapes and floppy disks (and, potentially, CD-ROMs and electronic printing-on-demand) could overlap and duplicate the NTIS sales program, absent a consolidation of or close cooperation between NTIS and SupDocs.
- Second is that SupDocs sales of online databases could overlap and duplicate offerings by individual agencies, agency online gateways (such as the National Library of Medicine), and/or private (or nonprofit) online gateways or database providers that include Federal agency databases, absent agency agreements. While multiple government sales outlets for the same tapes and disks may be cost-effective, given the small breakeven volumes, multiple government outlets for sales of online services may be hard to justify, considering the more substantial development, staff, and capital investment requirements.
- Third, sales of electronic formats could involve heavier demands for user support and generate the need for far more sophisticated and extensive customer service—from GPO, agencies, and/or vendors—than is expected for paper (or microfiche) formats.

GPO faces two major challenges with respect to staffing: retaining the necessary skilled labor force to maintain traditional printing services at a level commensurate with demand, and obtaining personnel with the new skills needed to implement GPO's future role in electronic publishing and electronic information dissemination, however that role may be defined. With respect to capital investment, it would seem prudent for GPO to carefully reevaluate its capital investment plans in light of possible adjustments to traditional printing services and possible new electronic initiatives. Staffing and capital investment decisions are best made within an overall strategic framework for the future of GPO.

The discussion in this chapter focuses on technical, financial, organizational, labor, and demand questions and not on the broad policy issues addressed in chapters 11 and 12. The alternatives presented here assume that Congress would take whatever policy actions were necessary to implement the particular alternative. In other words, this chapter is intended to probe more deeply into several of the possible alternatives for GPO. Also, although the alternatives are framed in terms of GPO, the discussion applies equally regardless of the name, for example, Government Information Office or Government Publications Office.

The alternatives explored in this chapter are:

- Traditional GPO—centralized
- Traditional GPO—legislative branch only
- Electronic GPO—decentralized

Each of these alternatives is defined and discussed below. The order of discussion does not imply an order of preference or priority, but was chosen to facilitate the presentation. Key facts and analyses are incorporated at the first appropriate place and then referenced in subsequent discussion rather than repeated. Discussion relevant to SupDocs is also found in chapter 5, which focuses on an electronic NTIS and NTIS/SupDocs cooperation.

TRADITIONAL GPO—CENTRALIZED

Under this alternative, GPO would continue to provide centralized conventional printing services (that is, Federal Government ink-on-paper printing would be obtained from or through GPO), disseminate paper formats on a sales basis through SupDocs, and disseminate paper and microfiche formats to the Depository Library Program (DLP). GPO would do very little electronic dissemination, as is the situation today. The mission agencies would handle electronic dissemination themselves, including direct distribution to the depository libraries to the extent needed. Note that printing services are defined to include composition, printing, binding, blank paper sales, and related activities.

Demand for Traditional GPO Services

A logical starting point for the analysis is to examine demand for traditional GPO services. The two major components of demand are printing services, and publication sales. In fiscal year 1987, these accounted for 88.7 percent and 8.4 percent of total revenue, respectively. The 10-year trend data for these two items are shown in Table 4-1. Clearly, other than the temporary decline in printing services during fiscal year 1981 and fiscal year 1982 (almost half of which was due to reductions in congressional work), the overall trends show a gradual increase in printing services and a rather steady increase in sales of publications. Even accounting for inflation, there is no historical evidence of weakness in the demand for traditional GPO services.

Looking to the future, most independent projections suggest that overall general demand for paper formats will continue for at least 5 years at a slow growth or, at worst, steady state level—even in the face of rapid growth in electronic formats. This projection should apply to the Federal Government as well, short of a severe fiscal crisis. There is no evidence that agency budgetary restraints in the past few years have translated into a significant reduction in actual printing services obtained from GPO.

Table 4-1.—GPO Revenues for Printing Services and Publications Sales, Fiscal Years 1978-87
(in millions of dollars)

Fiscal year	Printing services	Sales of publications
1978	$499	$44.4
1979	606	44.4
1980	672	47.6
1981	644	51.3
1982	608	55.0
1983	637	57.1
1984	739	59.4
1985	771	59.3
1986	737	62.9
1987	773	73.5

SOURCE: U.S. Government Printing Office, 1988.

However, in the longer term, significant reductions in paper formats could occur. OTA's independent printing consultant reviewed GPO's current product line and, using several different methodologies, concluded that about 60 percent of GPO's current products could potentially be suited for electronic formats, although realistically perhaps only one-half of this amount (or 30 percent) would be suited for electronic dissemination and even this would not automatically mean that paper dissemination would be eliminated.[1] Any actual switch from paper to electronic formats would most likely take place gradually, since electronic dissemination requires that the recipient (user) as well as the sender have the necessary equipment and knowhow. On the other hand, results of the GAO survey of Federal information users, highlighted later in this chapter, indicate that many users desire to increase dramatically their use of electronic formats within the next 3 years. These findings, coupled with the ambitious automation plans and activities of many Federal agencies, suggest the following projections:

- 1 to 3 years—steady state in demand for paper formats; rapid growth in electronic formats, but still a very small percentage of total demand;
- 3 to 5 years—demand for paper formats may start to decline; demand for electronic formats are likely to reach critical thresholds for several types of Federal information;
- 5 to 10 years—demand for paper formats are likely to decline markedly in some categories but would still be significant for traditional government books, reports, and publications; electronic formats are likely to dominate for many types of information.

However, even though there is not likely to be a precipitous near-term decline in overall demand for paper formats, GPO is particularly vulnerable to changes in demand for products that are printed at the main GPO plant in Washington, DC. This is because the bulk of GPO overhead and labor are located at the main plant, and also because about three-quarters of GPO's total printing work is contracted out (known as procured printing). These figures are highlighted in Table 4-2 for fiscal year 1987.

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[1] Frank Romano, "Decision Analysis Framework for GPO Strategic Alternatives," contractor report prepared for OTA, January 1988.

In addition to the 3,500 personnel allocated in Table 4-2 to procured, main plant, and regional printing, there are 692 administrative and support personnel located primarily at the main plant and 930 personnel assigned to the SupDocs office. The SupDocs personnel are supported through sales revenues, appropriations (for DLP and by law dissemination), and agency reimbursements (for reimbursable dissemination), and are not counted as part of GPO overhead. However, the administrative and support personnel, plus main plant maintenance, utilities, and the like, are included in general overhead, which is allocated across all major GPO activity centers.

Any reduction in the GPO work load would result, at least in the short run, in spreading the general overhead over a smaller base and, thereby, increasing unit costs. Moreover, reductions in the main plant work load would have a magnified impact since the high costs of main plant operations would be allocated over a smaller base of main plant work thus driving up the unit costs even further, all other things being equal.

Main plant operations are particularly vulnerable to changes in the legislative branch work load, which is concentrated at that plant.

Table 4-2.—GPO Billings and Labor Force Breakdown, Fiscal Year 1987

	Procured printing	Main plant printing	Regional plant printing
Billings ($ millions)	$576	$180	$14
(Percent of total)	74.8%	23.4%	1.8%
Labor force assigned (persons)	637	2,619[a]	244
(Percent of total)	18.2%	74.8%	7.0%

[a] Excludes 692 administrative and support personnel and 930 SupDocs personnel.

SOURCE: U.S. Government Printing Office, 1988.

As shown in Table 4-3, about 80 percent of all legislative branch work is done inplant, while about 85 percent of all executive branch work is contracted out. Of the 20 percent (or $23 million worth) of legislative branch printing that is procured, only about $1 million is for Congress itself, with the remainder for legislative branch agencies and extra copies of agency documents for SupDocs and DLP. Also, about 45 percent of inplant work is legislative, while about 95 percent of contracted work is for the executive branch. Judicial branch work is split about 50-50 between inplant and procured printing, but represents only a fractional percentage of total GPO work compared to about 15 percent for the legislative branch and 85 percent for the executive branch. Also, over 90 percent of inplant work is done at the main plant, with the remainder at GPO regional plants. Complete fiscal year 1987 workload data are presented in Table 4-3. Again, note that the term "printing" is defined to include composition, layout, printing, binding, blank paper sales, and other associated services in addition to printing.

An analysis of fiscal year 1987 billing data for the GPO main plant indicates that a significant portion could be suitable for electronic dissemination or could be vulnerable to competition from electronic formats. The major items are listed in Table 4-4 with fiscal year 1987 billing amounts indicated. Other significant main plant billing items which are judged as not suitable for electronic formats include such things as envelopes, books, letter head stationery, note pads, passports, and postal cards. Some main plant billings are for personnel services only (e.g., *Congressional Record*

Table 4-3.—GPO Workload Distribution, Fiscal Year 1987 (in millions of dollars)

	Procured printing	Main plant printing	Regional plant printing	Totals
Legislative branch	23	90	—	113
Judicial branch	1	1	—	2
Executive branch	552	90	14	656
Totals	$576	$181	$14	$771

SOURCE: U.S. Government Printing Office, 1988.

Table 4-4.—Electronic Potential for Main Plant Products

Major product	Fiscal year 1987 billings (in $ millions)	Electronic potential
U.S. Code	1.4	Online and CD-ROM distribution could reduce demand for paper format.
Forms	5.8	Electronic filing and electronic printing-on-demand could reduce demand for paper formats in medium to long-term.
Pamphlets	11.5	Online, CD-ROM, diskette, and electronic mail/bulletin board distribution along with electronic printing-on-demand could reduce demand for paper formats in medium-term.
Bills, resolutions, amendments	11.0	Online authoring, editing, publishing, and status systems along with online and CD-ROM distribution could significantly reduce demand for paper formats.
Calendars	2.0	Online systems could reduce demand for paper formats.
Code of Federal regulations	8.6	Online and CD-ROM distribution could reduce demand for paper formats.
Committee prints	3.5	Online, CD-ROM, and diskette distribution along with electronic printing-on-demand could reduce demand for paper formats.
Committee reports	4.2	
Congressional Record-Daily	13.0	Online and CD-ROM distribution could sharply reduce demand for paper formats.
Federal Register	17.7	Online and CD-ROM distribution could sharply reduce demand for paper formats.
Hearings	17.6	CD-ROM distribution could reduce demand for paper formats.
Total	96.3	

SOURCE: Billings from GPO; Electronic Potential from OTA, 1988.

indexers at $0.75M, details to congressional committees at $6M).

Overall, just over half of the main plant work could be affected by electronic formats. The vulnerable congressional work is particularly significant and amounts to about 45 percent of main plant billings if the *Federal Register* and *Code of Federal Regulations* (*CFR*) are included. In principle, reductions in inplant work could be offset by shifting some procured work to in-plant printing. However, the congressional work is quite unique and specialized, with little work of a similar nature currently being procured, unlike forms and pamphlets where work could be rather easily shifted from procured to in-plant printing. Also, once initial press runs reached small enough levels, certainly in the few hundreds of copies and possibly in the few thousands, fully electronic composition and printing would likely be cost-effective. In other words, primary dissemination could shift from paper (or paper and microfiche) to electronic with a small initial press run (e.g., a few thousand copies) of paper copies and possibly some microfiche copies (on a transitional basis). Any subsequent dissemination of paper copies could be on a printing-on-demand basis for complete copies or, probably more common, printing of selected pages.

Impacts of Medium-Term Reductions in Traditional Demand

Realistically, any significant transition from paper to electronic formats would take place over several years, so GPO would have time to adjust. Basically, GPO could make up for any shortfall by transferring a portion of procured printing (primarily executive branch work) to the main plant or reducing main plant operating costs or some combination of the two. The major drawback of transferring more work in-house is that the main plant work costs significantly more than procured work. Thus, either the executive agency customers would pay considerably more than they do now, or

GPO would have to charge considerably less than full cost to offer a competitive price.

GPO Cost and Labor Force Structure

The cost of GPO work for 20 sample printing jobs is shown in Table 4-5 in cost per 100 pages and total cost, averaged over all 20 jobs. For these 20 sample jobs, the average main plant regular rate cost was more than double the procured cost. While these 20 jobs do not constitute a statistically valid sample of all GPO work, the sample jobs were selected by GPO as being reasonably representative. (See ch. 11 for further details.)

In recent years, GPO has been offering a special rate for some executive branch printing jobs done at the main plant. The rate is based on the tenth lowest bid for comparable procured work plus ten percent. For the 20 sample jobs, the average main plant cost using the special rate was about 45 percent higher than the procured cost. The special rate is intended to recover variable costs and make some contribution to general overhead. This would appear to be the case, since the special rate for the 20 sample jobs averaged about 68 percent of the regular rate that presumably covers full costs. According to GPO, the average direct labor rate is about 30 percent of full costs. So the special rate does appear to more than cover direct labor. If one assumes direct labor to be a fixed cost, at least in the short-term, the special rate appears to easily cover the cost of expendables (e.g., paper, ink) plus make a contribution to overhead. Of course, on the other hand, the greater the use of the special rate, the greater the overhead rate will be for the balance of the work, all other things being equal.

Table 4-5.—Cost of GPO Work, 20 Sample Jobs

	Main plant procured[a]	Main plant regular rate[b]	Main plant special rate[c]
Total cost....	$100,017	$213,281	$144,881

[a] Procured estimates based on general usage contracts using the average price of the first 5 lowest bidders.

[b] Main plant regular rate estimates based on the GPO price scale as of Dec. 1, 1987.

[c] Main plant special rate estimates based on the 10th lowest bid plus 10%.

SOURCE: U.S. Government Printing Office, 1988.

There are several reasons for the higher main plant costs. First and foremost, GPO is a unique printing facility in terms of product mix, schedule requirements, and customer base. GPO produces a much more diversified set of printing products than any single private sector printing facility. As a consequence, GPO operates and maintains a much wider range of equipment than do private printing companies. Most private firms specialize in a small number of products, to keep overhead down and maximize economies of scale. Second, to provide quick turnaround of congressional work and overnight printing of the daily *Congressional Record* and *Federal Register*, GPO operates on a three shift basis. This results in significantly higher costs for staffing, supervision, maintenance, and general overhead. The overnight operations are so important that, in 1987, GPO designated an Assistant Public Printer to provide overall on-site management of the night operations. Third, as a government agency, GPO provides such services as employee and congressional relations, public affairs, inspector general, equal employment, labor relations, safety and health, and the like, many of which contribute to higher general overhead than in private companies.

Overall, GPO is a labor intensive organization. After deducting the cost of procured printing and sales of publications and the surplus (net profit), about two-thirds of the remaining costs are for labor, about one-fifth for supplies and materials, and one-tenth for utilities and the like. The GPO cost structure, based on fiscal year 1987 data, is shown in Table 4-6. Data for main plant costs shown in Table 4-7 confirm the general cost structure noted above.

With respect to the total GPO labor force, a significant downsizing has already taken place. Over the past 12 years, total GPO employment has declined by about 3,500 persons or 40 percent (from 8,632 in fiscal year 1975 to 5,122 in fiscal year 1987). As shown in Table 4-8, the reductions have been spread across several GPO activities, but with the highest absolute and percentage reductions occurring

Table 4-6.—GPO Cost Structure, Fiscal Year 1987

Cost element	Percent of fiscal year 1987 revenue dollar
Procured printing	61.5
Sales of publications	2.3
Surplus	2.6
Subtotal	66.4
Labor	22.4
Supplies and materials	6.1
Rents, communications, and utilities	3.3
Capital expenditures	0.8
Other	1.0
Subtotal	33.6
	Percent of fiscal year 1987 revenue dollar less cost of procured printing and sales plus surplus
Labor	66.6
Supplies and materials	18.2
Rents, communications, and utilities	9.8
Capital expenditures	2.4
Other	3.0
Total	100.0

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

Table 4-7.—GPO Main Plant Cost Structure, Fiscal Years 1984 and 1985

	Percent of total costs	
Cost element	Fiscal year 1984	Fiscal year 1985
Labor	65.0	66.8
Supplies and materials	26.2	25.0
Rents, communications, and utilities	4.3	4.4
Depreciation	3.3	2.6
Other	1.2	1.2
	100.0	100.0

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

in the composition, printing, binding, procurement, personnel management, and documents sales/distribution areas. Most of these labor force reductions resulted from advances in printing technology and improvements in management efficiency. The reduction in personnel management in part reflects the reassignment of apprentices from personnel to the appropriate operating units.

Medium-Term Outlook

To sum up, near-term demand for traditional GPO services appears to be stable, absent a severe fiscal crisis on the part of the customer agencies or some other circumstance that would precipitate a rapid decrease in conventional printing activity, and assuming the executive agencies continue to be required to obtain printing from or through GPO.

On the other hand, the GPO main plant appears to be vulnerable in the medium-term (3-5 years) and beyond due to the combination of electronic competition for some major product lines (such as the *Congressional Record* and *Federal Register*), and a high overhead cost structure necessitated largely by GPO's current responsibilities. Additional executive agency work could be shifted from private printing companies to the GPO main plant, but this would likely increase the cost to the agencies. GPO could charge a special, lower rate for most agency work, but this would mean some portion of overhead would be uncovered and have to be paid out of direct appropriations or, possibly, reimbursed from net revenues on sales of publications. These latter alternatives would appear to require amendment of the relevant provisions of Title 44 of the U.S. Code. On the other hand, it is possible that cost reductions resulting from the provision of electronic alternatives to the *Record* and *Register* (among other publications) could offset any cost increases that might result by shifting more executive agency work from procured to inhouse printing.

GPO could attempt to further reduce operating costs, but this may be difficult given the already substantial labor force reductions obtained since the mid 1970s, absent a basic restructuring of GPO responsibilities and operations. Some additional labor cost reductions are likely to occur as agencies assume greater responsibility for composition and other prepress functions, as a consequence of desktop and high-end electronic publishing capabilities. However, in other production areas, such as press and binding, projected retirements could create an actual labor shortage, according to GPO. OTA's independent labor consultant concluded that GPO's workforce is relatively old (average age of 45.2 years) and that 13 percent of the work force (687 persons) is eligible

Table 4-8.—Major Changes in GPO Labor Force, Fiscal Years 1975-87

Selected labor force categories[a]	Fiscal year 1975	Fiscal year 1987	Net change	
			Number	Percent
Document sales/distribution	1,833	930	−903	−49.3
Composition	1,632	616	−1,016	−62.3
Binding	1,166	630	−536	−46.0
Press (includes prepress)	1,006	701	−305	−30.3
Printing procurement (excludes regional)	718	432	−286	−39.8
Engineering and facilities	490	359	−131	−26.7
Personnel (includes apprentices in fiscal year 1975, but not in fiscal year 1987)	332	104	−228	−68.7
Financial	367	250	−117	−31.1
Materials	269	205	−64	−23.8
Security	124	79	−45	−36.3

[a]Labor force categories selected and defined to permit FY75-87 comparison; may not correspond exactly with current labor force categories.
[b]As of Aug. 5, 1987.

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

to retire immediately. About 35 percent of the GPO work force has over 20 years of service.[2] There is also the possibility of reducing GPO's overhead costs, discussed later.

GPO Plant and Equipment

Other areas of possible cost savings include the purchase or construction of a new main plant building, and the upgrading of conventional prepress, press, and binding technology. A 1982 GAO study identified numerous inefficiencies in GPO's facilities—including materials handling, storage, and production flow problems at the main plant.[3] OTA's independent printing consultant examined all of these areas and concluded, first, that there is no compelling need for a new plant. The present building was specifically built to handle the load factors of the printing process, whereas very few commercial printing facilities were originally designed for printing. Most new plants are on one floor, rather than a multi-floor facility such as GPO's, and do offer some production efficiencies not currently available to GPO. However, continued renovation and upgrading of the main plant elevators should help compensate. Also, a single level building would require much more acreage and would probably have to be located much further away from GPO's customer base in Congress and the executive agencies. **Overall, OTA's printing consultant concluded that the GPO main plant is equal to most commercial printing facilities handling a comparable volume of work.** However, if viable options become available to GPO, a detailed evaluation would be warranted, taking into account all the factors mentioned above and others, especially any strategic decisions on GPO's future role in conventional printing and electronic publishing and dissemination. One GPO building option currently under consideration involves a plan to transfer GPO's main plant to GSA in exchange for the construction of a new plant on property in the Washington Navy Yard, and to relocate SupDocs to a site in Suitland, Maryland. As noted in the 1982 GAO report, cost-benefit analyses of all serious alternatives are warranted, including continued renovation of the existing main plant building, as well as construction of a new building. Cost-benefit studies would appropriately include consideration of the impacts on the cost, quality, and timeliness of GPO main plant services, productivity of GPO main plant operations, and, to the extent possible, GPO's general morale, sense of direction, and strategic outlook.

With respect to printing technology, OTA's printing consultant concluded that GPO technology at the main plant was generally on a par

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[2] Gregory Giebel, "Technological Changes at the Government Printing Office," contractor report prepared for OTA, January 1988.

[3] U.S. General Accounting Office, Report to the Chairman, Joint Committee on Printing, *GPO Needs to Analyze Alternatives to Overcome Limitations in Government Printing Operations*, PLRD-82-20, Jan. 4, 1982.

with or exceeded the top fifth of the commercial printing industry. GPO was found to be on a par with the top 5 percent of private firms with respect to composition technology, the top 11 percent for press technology, and substantially ahead for bindery technology (a more exact estimate here was not possible given the differences between the GPO product mix and that of typical commercial firms). GPO has stayed abreast of the private sector with respect to conventional technology as a result of gradual, but continuous equipment upgrades. As long as GPO provides a substantial volume of inplant printing services, periodic equipment upgrades are likely to be cost-effective.

Perhaps the best example of GPO's performance in adopting new technology is the now fully completed transition from hot type composition to electronic photocomposition at the main plant. This transition took place largely during the 1970s. In fiscal year 1968, only 40,000 pages were phototypeset. This increased to over 700,000 pages in fiscal year 1972, over 1 million pages in fiscal year 1976, and over 2.75 million in fiscal year 1980. As of fiscal year 1986, about 3.7 million pages per year were being phototypeset. Another example is the rapid increase in electronic input to the GPO printing process over the past several years. As of fiscal year 1987, about three quarters of material phototypeset at the GPO main plant was received in electronic form.

With respect to conventional press and bindery equipment, GPO has nearly completed a major equipment upgrade stretching over the past decade. Selected major equipment acquisitions are listed in Table 4-9 along with the acquisition date and cost for each item. Since 1977, GPO has invested almost $15 million in major press equipment, and over $10 million in bindery equipment. Actual totals are higher than shown, since a large number of small equipment items plus furniture, vehicles, and extensive renovations are not listed here.

Based on all of the above, OTA has concluded that, despite the possibly misleading

Table 4-9.—Selected Major Equipment, Acquisitions, GPO Press and Bindery, Since 1977, as of September 1987

Item	Acquisition year	Acquisition cost in dollars
Press Division		
Letter Press-Envelope	1986	48,500
Letter Press-Auto Feed Dryer	1987	98,303
Offset Press-Harris	1986	40,663
Offset Press (5 units)	1979	2,025,000
Offset Press 35x50 (2 units)	1981	6,264,000
Copier-Xerox 9200 II	1979	62,530
Offset Press-Miehle 43x60 (7 units)	1977	1,918,000
Offset Press-Harris (2 units)	1980	66,000
Offset Press-Web (3 units)	1979	2,136,000
Offset Press-5 Color Postal Card	1986	1,104,674
Cut-Pack System-Postal Card	1987	970,084
Total Press Division		14,733,754
Binding Division		
Paper Cutter-71 inch	1986	75,237
Strapping Machine	1987	2,623
Machine Wrap-Stretch Plastic (2 units)	1979	23,000
Inserter-Stitcher Complete	1987	326,400
Trimmer-3 Knife (2 units)	1981	243,000
Folding Machine (6 units)	1985	420,000
Labeler Machine	1986	4,311
Shredder	1987	19,272
Perforator (2 units)	1984	15,600
Nipping Machine	1985	13,900
Paper Cutter	1986	47,139
Trim Paper Collection	1987	39,495
Waste Paper System	1986	40,582
Perforator (2 units)	1982	17,200
Passport Machine	1987	1,213,650
Nipping Machine	1983	12,300
Sewing Machine-Smyth No. 12	1980	17,355
Cutter Spacer-Lawson	1984	70,000
Eyelet Attacher Machine	1978	5,045
Wrapping Package Machine	1979	37,972
Casemaking Machine-Smyth	1979	25,138
Strapping Machine (4 units)	1982	20,000
Strapping Machine-Signode (3 units)	1984	63,000
Folding Endsheet Machine	1983	4,950
Casing-In Machine-Versamatic	1983	23,100
Copier-Xerox 9500 VR	1986	12,564
Adhesive Binder (2 units)	1983	6,343,347
Adhesive Mailer (2 units)	1983	977,498
Total Binding Division		10,113,678

SOURCE: U.S. Government Printing Office, 1988.

external appearance, the GPO main plant is, overall, essentially up-to-date with respect to conventional printing technology and already makes very extensive use of electronic input and photocomposition. There will, of course, be opportunities for future technology upgrades as the need arises. Overall, however, GPO is well positioned technologically to carry on its traditional printing responsibilities. The strategic challenge arises with respect to how GPO can remain competitive and maintain or improve cost-effectiveness in the face of possible future reductions in the demand for paper formats (and especially demand for major products produced at the main plant), increases in demand for electronic formats, and rapid progress in agency automation (including use of desktop and high-end electronic publishing). These possibilities are discussed later in this chapter.

TRADITIONAL GPO—LEGISLATIVE BRANCH ONLY

Under this alternative, GPO would continue to provide centralized conventional printing services, but only for the legislative branch. The printing procurement program would either be transferred to the executive branch (e.g., to GSA) or dispersed among individual agencies. Responsibility for the DLP could be retained at GPO, as could the sale of paper formats by the SupDocs, or these functions could also be transferred to the executive branch. GPO would do little electronic dissemination.

Analysis of this alternative is illustrative of one extreme on the spectrum of alternatives available and provides further insights into the functioning of GPO. The discussion here emphasizes financial and labor impacts (see ch. 11 and 12 for other implications).

To keep this in perspective, it is important to note that GPO was originally established in 1860 primarily to serve the printing needs of Congress and to eliminate the corruption in printing procurement that had become widespread. Over the following decades, executive branch printing needs grew much faster to the point where, for fiscal year 1987, 85 percent of GPO work is for the executive branch.

Financial Impacts

Using fiscal year 1987 data, the restriction of GPO to conventional printing for the legislative branch would have the following first order impacts, all other things being equal:

- the total workload of GPO would decrease from about $771 million to about $113 million or an 85 percent reduction;
- the total workload at the GPO main plant would decrease from about $180 million to $113 million ($90 million main plant work plus $23 million previously procured) or a 37 percent reduction (this assumes the $23 million in procured printing for the legislative branch would be shifted to the main plant);
- the total labor force of GPO would decline by about 881 persons or about 17 percent (637 printing procurement staff and 244 regional printing plant staff, all presumably transferred to GSA or elsewhere);
- the net income of GPO would decrease by about $4.6 million due to transfer of the printing procurement program which has operated at a net surplus for the past several years (presumably this net income would accrue to GSA, assuming the procurement program was kept intact and retained its effectiveness);
- the net income of GPO would increase by about $1 million due to transfer of the regional printing plants (which have operated at a net loss for the last several years), all other things being equal; and
- the net income less expenses at the GPO main plant would change from a surplus of several million dollars to a potential loss of several tens of millions.

These figures highlight how the GPO main plant operation is dependent on executive branch work to help spread the costs of gearing up to meet the quick turnaround and diverse needs of the legislative branch (and some executive branch work, such as the *Federal Register*). The executive branch work helps fill in the valleys between the peaks of the congressional work load and utilizes labor and plant capacity that would otherwise be underutilized. Both in-plant and procured executive branch work help cover GPO overhead expenses and are sources of net income.

The role of executive branch work can be illustrated using the assumptions about the main plant cost structure presented earlier. Starting with $180 million in main plant gross revenues and assuming a 2 percent profit or surplus, the total GPO main plant expenses would be $176.4 million. The cost breakout for the main plant would be as in Table 4-10. Now if gross revenues drop by 37 percent to $113 million due to the exclusion of executive branch work, total expenses would decrease by only 13 percent to about $154 million, if materials and supplies are assumed to be variable costs but labor, rent, and depreciation are assumed to be almost entirely (95 percent) fixed costs in the short run. The result is a swing from a net surplus of about $4 million to a net loss on main plant operations of about $41 million. If printing procurement were transferred out, there would be no net surplus from procurement to even partially offset this loss.

Labor Force Impacts

In order to return GPO to break even operations, it would be necessary, using this hypothetical calculation, to cut costs and/or increase revenues by a total of $37 million. Any significant cost reductions would probably necessitate labor force reductions, since further cuts in the other, much smaller cost categories would have marginal effects at most.

Recovering the entire hypothetical deficit would necessitate roughly a one-third reduction in the main plant labor force, assuming that this could be accomplished without jeopardizing the main plant's capacity to do the $113 million in legislative branch work. Reorganization of the production processes might be necessary—for example, scaling back or eliminating the night shift. Alternatively, some or all of the hypothetical deficit could be offset through increased appropriations and/or user fees.

If the hypothetical deficit was to be recovered through labor force reductions, a total reduction in force of about 1,100 employees would be needed, assuming a total main plant work force of 3,311, calculated as shown in Table 4-11. The main plant labor force of 3,311 persons is estimated by deducting the SupDocs staff (which operates on a breakeven ba-

Table 4-10.—Hypothetical Calculation of Financial Impact of Legislative Branch GPO

Main plant Executive and legislative work			Main plant Legislative work only	
Gross revenue		$180.0 million		$113.0 million
Less net surplus (assumed 2%)		−3.6		
Total expenses		176.4 million		
Assumed cost structure (as percent of total expense)			Assumed cost reduction	
Labor	67%	$118.2 million	−5%	$112.3 million
Materials and supplies	25%	44.1	−37%	27.8
Rent, communications, and utilities	4.4%	7.8	−5%	7.4
Depreciation and other	3.6%	6.3	−5%	6.0
		$176.4 million		$153.5 million
Net income or (loss)		$ 3.6 million		($ 40.5 million)

SOURCE: Office of Technology Assessment, 1988.

Table 4-11.—Hypothetical Main Plant Total Labor Force Reductions

Fiscal year 1987 total GPO labor force	5,122
Less SupDocs staff	−930
	4,192
Less regional printing staff	−244
	3,948
Less printing procurement staff	−637
Current main plant labor force	3,311
Less 1/3 reduction in force	1,100
Reduced main plant labor force	2,211

SOURCE: Office of Technology Assessment, 1988.

sis, financially separate from the main plant) and the regional printing and printing procurement staffs (which would, in this hypothetical example, be transferred to GSA). The hypothetical one-third labor force reduction is calculated by dividing the net loss ($37.3 million) into the main plant labor costs ($110.0 million).

GPO has previously estimated that about 78 percent of the employees in the main plant Photocomposition, Press, and Binding Divisions would be required to perform the legislative branch work (GPO defines this as congressional work plus the *Federal Register*, postal cards, passports, *CFR*, and OMB and Presidential documents). This means that the fiscal year 1987 staffing level of 1,947 persons for these divisions could be reduced by only 428 persons (22 percent) in order to maintain the necessary capacity. The remaining reduction of 672 persons (to provide a total of 1,100) would have to come from the Executive Office, Operations, and Production Divisions. These divisions had a fiscal year 1987 combined staffing level of 1,364 persons, which would translate into a roughly 50 percent staff cut (672 out of 1,364) for these areas. The calculations are shown in Table 4-12.

Table 4-12.—Hypothetical Main Plant Divisional Labor Force Reduction

	Persons
Electronic Photocomposition Division	616
Press Division	701
Binding Division	+630
Current FY87 labor force	1,947 ×.78
Reduced labor force	1,519
Staff reductions	428
Executive Office	693
Operations Division	359
Production Division	313
Current FY87 labor force	1,364 ×.50
Reduced labor force	682
Staff reductions	682
Total staff reductions	1,110
Total remaining labor force	2,201

SOURCE: Office of Technology Assessment, 1988.

Options available to GPO for handling these hypothetical reductions would depend on how fast they had to be made. Overall, GPO has a relatively old labor force with about 13 percent of its employees eligible for retirement, and about 35 percent having 21 or more years of service. Some craft units have even higher percentages. For example, of the 547 composers (International Typographical Union, Local No. 101), 176 (or 32 percent) are eligible for retirement and 326 (or 60 percent) have 21 or more years of service, as shown in detail in Table 4-13.

If three years were available to make the transition to a legislative branch GPO, the 22 percent reduction in the photocomposition, press, and binding labor force probably could be made mostly through natural attrition (averaging 5-10 percent per year at the main plant). However, the 50 percent reduction in the executive office, operations, and production labor force probably could not be made over this period of time through natural attrition, and some early retirement buyouts might be necessary. Of course, the hypothetical transition would be easier if more time were available.

Other Vulnerabilities

As a final note, the "traditional GPO-legislative branch only" alternative would be especially vulnerable to any significant future reductions in the demand for paper formats. Prior GPO analyses have, indeed, documented

Table 4-13.—GPO Main Plant Composers, Years of Service and Retirement Eligibility, Fiscal Year 1987

	Number of employees
Years of service	
0-5	19
6-10	1
11-15	40
16-20	161
21-25	193
26-30	94
31-35	33
36-40	6
41+	0
Total	547
Retirement eligibility	
Age 55/30 years service	32
Age 60/20 years service	85
Age 62/5 years service	59
Total	176

SOURCE: U.S. Government Printing Office, 1988.

Table 4-14.—Changes in GPO Main Plant Volume for Eight Principal Products[a], 1975-1984

	1975 number	1984 number	Percent change
Titles	28,893	13,854	−55
Original pages (in millions)	1.048	0.886	−16
Copies (in millions)	134.6	48.7	−64
Pages per copy (average)	36	64	+78
Printed pages (in trillions)	4.85	3.12	−36

[a] Daily *Congressional Record; Federal Register*; bills, resolutions, and amendments; committee hearings; committee reports; committee prints; calendars; and *Code of Federal Regulations*.

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

significant reductions over the 1975-1984 period.

The combined totals for eight principal main plant products (daily *Congressional Record*; *Federal Register*; bills, resolutions, and amendments; committee hearings; committee reports; committee prints; calendars; and the *Code of Federal Regulations*) showed declines of 64 percent in total number of copies printed. However, this reflected primarily a 55 percent reduction in the number of titles, which is a function of a lower overall level of congressional activity rather than an indication of lower demand. The number of pages declined by only 16 percent, which means that the average number of pages per title must have increased significantly over this period of time (for example, fewer but longer reports and bills). Indeed, as shown, the average number of pages per copy almost doubled, from 36 to 64 pages. Nonetheless, over the 1975-1984 period, the total number of pages printed at the GPO main plant for these eight products declined by about 36 percent. The statistical results are shown in Table 4-14.

This volume reduction would be expected to increase drastically per unit costs, all other things being equal. However, all other things were not equal. During this period, the GPO labor force decreased by about 34 percent, and more productive, less labor-intensive equipment was deployed. Some of the difference was also made up in price increases. However, as the trend data indicate (Table 4-15), billings for key congressional printing and binding items remained remarkably stable, increasing by only 1.4 percent through fiscal year 1983 and by about 17 percent through fiscal year 1984.

Trend data for the entire fiscal year 1975-1987 period show only minor changes in GPO billings for hearings, committee prints and reports, and calendars. As indicated in Table 4-16, billings for bills, resolutions, and amendments were up significantly, although this may reflect a fiscal year 1987 anomaly since fiscal year 1986 billings were $8.41 million, up only marginally from the $7.97 million expended in fiscal year 1975. The only dramatic changes were for bills, resolutions, and amendments (up 35 percent), the *Congressional Record* (up 71 percent) and the *Federal Register* (up 128 percent), as shown below. These latter two items are: among the biggest work orders at the main plant, very labor intensive, the primary reason (along with congressional bills and reports) for overnight operations at the main plant, and among the more vulnerable main plant products with respect to competition from electronic formats. As mentioned elsewhere in this chapter, the *Record* and *Register* are both highly suited to online and CD-ROM electronic formats.

Table 4-15.—Congressional Printing and Binding Billings Selected Items, Fiscal Years 1975, 1983, and 1984

Item	Fiscal year 1975	Fiscal year 1983	Fiscal year 1984
	(in thousands of dollars)		
Hearings	$17,746	$16,684	$22,304
Miscellaneous printing and binding	9,776	8,720	10,042
Bills, resolutions, and amendments	7,965	7,552	6,827
Miscellaneous publications	3,680	4,130	4,585
Committee prints	4,372	2,956	3,065
House and Senate calendars	1,720	1,256	2,138
Documents	466	1,571	958
Committee reports	2,644	2,827	3,048
Franked envelopes	815	759	1,111
Congressional Record (daily)	8,287	11,794	13,352
Totals	$57,471	$58,249	$67,430

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

Table 4-16.—Congressional Printing and Binding Billings, Selected Items, Fiscal Years 1975 and 1987

Item	Fiscal year 1975	Fiscal year 1987	Percent change
	(in thousands of dollars)		
Hearings	$17,746	$16,835	−5.1%
Bills, resolutions, and amendments	7,965	10,830	+36.0
Committee prints and reports	7,016	7,247	+3.3
House and Senate calendars	1,720	1,543	−10.0
Congressional Record (daily)	8,287	11,173	+35.0
Federal Register (daily)	7,776[a]	17,697	+128.0

[a] Includes billings for congressional copies only and thus understates total billings.

SOURCE: U.S. Government Printing Office and Office of Technology Assessment, 1988.

ELECTRONIC GPO—DECENTRALIZED

Under this alternative, the GPO would continue to provide centralized conventional printing services (that is, Federal Government ink-on-paper printing would be obtained from or through GPO), expand the range of electronic publishing services available to agencies, disseminate selected electronic formats on a sales basis through SupDocs as well as traditional paper formats, and disseminate selected electronic as well as paper and microfiche formats to the DPL. However, government dissemination of electronic formats would not be centralized solely via GPO. Mission agencies could, at their discretion, disseminate their own electronic formats, or they could opt to utilize SupDocs, or both. SupDocs could, at its discretion, select those electronic formats judged to be suitable for inclusion in the sales program. Furthermore, electronic formats selected for inclusion in the DLP would be distributed to the depository libraries either directly by the agencies or via GPO. Also, this alternative assumes that GPO would develop and maintain a governmentwide information index in cooperation with NTIS and would actively participate in governmentwide standards-setting and innovation activities concerning electronic printing, publishing, and information dissemination.

This alternative, labelled for convenience "Electronic GPO-Decentralized," most closely aligns with the current development path of GPO. GPO is conducting a number of relevant pilot projects, and is experimenting with and occasionally implementing precursor electronic applications. This alternative is conceptually viable, and, therefore, warrants careful consideration, due to the convergence of several key trends in electronic technology and demand for Federal information in electronic formats.

Trends in Technology and Demand

Technology Trends

One key technology trend is the rapid increase in agency automation, which means that most agencies already are creating their original information products in electronic form, and many are also converting this material to a camera-ready format. OTA's independent printing consultant estimated that about 25 percent of the original material is being provided by Federal agencies to GPO in camera-ready format. For these pages, no typesetting or page composition by GPO is required. Almost all (98 percent) of this camera-ready material is estimated to originate from executive branch agencies. The other 75 percent of the original material is being provided to GPO in a variety of formats, primarily electronic, as shown in Table 4-17.

The overall picture that emerges is as follows. Almost all executive agency material is being provided to GPO in camera-ready or electronic formats, with very little material requiring GPO keyboarding. Almost all agency electronic input is via magnetic tape. On the other hand, roughly one half of all legislative branch material requires GPO keyboarding, roughly 10 percent is scanned, and the remaining 40 percent of electronic input is split between magnetic tape and fiber optic cable transmission. The distribution of origination formats is shown in Table 4-18 for camera-ready, manuscript, scanned, and electronic input as a percentage of total input and total by branch of government.

The executive branch agencies are able to capture their own electronic keystrokes and, increasingly, do their own electronic composi-

Table 4-17.—Origination Formats[a] for Material Submitted to GPO, as Percent of Total

Format	Executive branch	Legislative branch	Totals
Manuscript copy[b]	2.6 %	23.4 %	26%
Scanned entry	0.5	4.5	5
Magnetic tape	41.6	10.4	52
Floppy disk	1.96	0.04	2
Fiber optic cable	0	10.0	10
Other electronic transmission	4.25	0.75	5
			100%

[a] excluding camera-ready copy.
[b] requiring keyboarding.

SOURCE: U.S. Government Printing Office, F.R. Romano, and Office of Technology Assessment, 1988.

Table 4-18.—Origination Formats, Including Camera-Ready, as Percent of Total and by Branch of Government

	Percent of all Government totals			Percent of all branch totals	
Format	Executive branch	Legislative branch	Totals	Executive branch	Legislative branch
Camera-ready	24.5	0.5	25	39.1	1.3
Manuscript	1.95	17.55	19.5	3.1	47.0
Scanned entry	0.375	3.375	3.75	0.6	9.0
Electronic input	35.86	15.89	51.75	57.2	42.6
Totals			100	100	99.9

SOURCE: U.S. Government Printing Office, F.R. Romano, and Office of Technology Assessment, 1988.

tion, largely because of the widespread penetration of computer and word processing technologies and, recently, the rapid increase in the use of desktop and high-end electronic publishing. As noted in chapter 2, the GAO survey of 114 civilian departmental agency components indicated that many are using and/or testing relevant technologies, as summarized in Table 4-19.

The GAO survey did not ask for estimates of the absolute number of these technologies in use. However, these estimates can be developed from other relevant indicators, including the use of page makeup and page description software. OTA's independent printing consultant has estimated that, as of year end 1987, there were already over 20,000 units of page makeup software in use in the Federal Government, and over 125,000 units of page description software. The detailed breakout is in Table 4-20.

OTA's printing consultant estimates that, in addition, there are 200-350 high-end electronic printers (Xerox 9700 class) in use in the Federal Government. Just these three items alone account for over $200 million in installed base of electronic publishing technology (21K units page makeup at $600/unit + 127K units page description at $750/unit + 275 high-end electronic printers at 400K/unit = $12.6M + $95.3M + $110M = $217.9 M). This does not include high-end workstations and low-end laser printers, among other relevant technologies. Rough estimates for the latter are shown in Table 4-21.

These technologies represent, conservatively, roughly another $160 million in installed equipment (assuming 300 units high-end software at $40K/unit + 3,000 units highend workstations at $20K/unit + 30,000 units low-end laser printers at $3K/unit = $12M + $60M + $90M = $162M). These estimates suggest that the Federal Government, and primarily the executive agencies, have already invested about $350-$400 million in electronic publish-

Table 4-20.—Estimated Use of Electronic Publishing Software, Calendar Year 1987

Software/Vendor	Total units in United States	Estimated units in U.S. Government
Page makeup software		
Aldus Pagemaker	115,000	6,000
Xerox Ventura	85,000	12,000
All others	66,000	3,000
Totals	226,000	21,000
Page description software		
Hewlett-Packard PCL	210,000	29,000
Postscript	420,000	14,000
Proprietary for printer	790,000	67,000
Typesetter	125,000	8,700
Other laser printer	45,000	11,000
Totals	1,590,000	129,700

SOURCE: TypeWorld, F.J. Romano, 1988.

Table 4-21.—Estimated Use of Other Electronic Publishing Technologies, Estimated, Calendar Year 1987

Technology	Estimated units in U.S. Government	Estimated cost per unit
High-end electronic publishing software (e.g., Interleaf)	100s	$40K
High-end workstation (e.g., Sun)	1,000s	$20K
Low-end laser printers (e.g., HP Laserjet)	10,000s	$ 3K

SOURCE: Office of Technology Assessment, 1988.

Table 4-19.—Civilian Department Agency Use of Selected Electronic Technologies (percent of agencies responding)

Technology	Currently in operational use	Currently prototyping or pilot testing	Totals
Computer-aided page makeup	50.0	8.8	58.8
Computer graphics	65.8	7.9	73.7
Electronic photocomposition	43.9	7.9	51.8
Laser and other non-impact printing	64.0	1.8	65.8
Desktop publishing system	34.2	14.9	49.1
Electronic publishing system	21.1	10.5	31.6

SOURCE: U.S. Government Printing Office, F.R. Romano, and Office of Technology Assessment, 1988.

ing and related technologies, with no end to agency procurements in sight. Also, these figures do not include any allocation of the over 25,000 mainframe computers and the estimated 500,000 microcomputers in the Federal Government that are used in part for electronic publishing applications. Finally, these figures do not reflect the rapidly growing agency pilot tests and operational applications for direct electronic dissemination via bulletin boards, electronic mail, CD-ROM, and the like.

Trends in Demand

This high level of agency activity reflects, in part, opportunities presented by advancing technology and the overall drive to automate agency functions. However, agency activities also reflect growing demand on the part of Federal information users to receive information in electronic formats.

The results of the GAO survey of Federal information users document this demand. For example, the depository library community, which heavily reflects university, research, and Federal libraries, indicated a strong preference to obtain increasing percentages of Federal information in electronic form and declining percentages in paper and microfiche. The results for 318 depository libraries responding out of a sample of 450 (34 out of 50 regional depository libraries and 284 out of 400 selective depository libraries) are highlighted in Table 4-22. Only the most significant changes are included here. These results show that the library community desires or anticipates decreases in use of paper and microfiche formats, significant increases in electronic mail or bulletin boards and floppy disks, and substantial increases in online databases and compact optical disks.

Trends for other segments of the Federal information user community are not so dramatic but show a similar pattern. The results for 109 scientific and technical associations responding to the GAO survey (out of a sample of 250) are highlighted in Table 4-23.

The GAO survey of Federal agencies indicates that agency use of electronic dissemina-

Table 4-22.—Depository Library Demand for Federal Information, by Type and Format

		Number of libraries using		
Type of information	Format	Now	Next 3 years	Percent change
Congressional record/hearing/ reports/bills	paper	271	234	−13.7
	microfiche	274	225	−17.9
	online database	59	132	+124.0
	floppy disk	0	27	large increase
	compact optical disk	3	112	+3,633.0
Scientific and technical reports/information	paper	244	172	−17.2
	microfiche	212	159	−21.7
	online database	76	95	+25.0
	floppy disk	1	27	+2,600.0
	compact optical disk	9	78	+767.0
Press releases/bulletins	paper	246	183	−25.6
	microfiche	39	35	−10.3
	electronic mail or bulletin board	9	51	+467.0
	online database	24	50	+108.0
	compact optical disk	1	18	+1,700.0
Statistical data	paper	309	270	−12.6
	microfiche	241	134	−44.4
	electronic mail or bulletin board	12	27	+125.0
	online database	103	158	+53.4
	magnetic tape/disk	11	25	+127.0
	floppy disk	12	65	+442.0
	videodisk	0	12	large increase
	compact optical disk	15	140	+833.0

SOURCE: GAO Survey of Federal Information Users, 1988.

Table 4-23.—Scientific and Technical Association Demand for Federal Information, by Type and Format

		Number of associations using		
Type of information	Format	Now	Next 3 years	Percent change
Congressional record/hearings/ reports/bills	paper	61	57	−6.6
	electronic mail or bulletin board	1	18	+1,700.0
	online database	4	22	+450.0
	floppy disk	0	13	large increase
Scientific and technical information	paper	89	75	−15.7
	microfiche	8	5	−37.5
	electronic mail or bulletin board	6	24	+300.0
	online database	9	30	+233.0
	floppy disk	6	20	+233.0
	compact optical disk	1	3	+200.0
Press releases/bulletins	paper	77	60	−22.1
	electronic mail or bulletin board	3	26	+767.0
	online database	5	16	+220.0
	floppy disk	1	10	+900.0
Statistical data	paper	60	49	−18.3
	electronic mail or bulletin board	1	11	+1,000.0
	online database	6	23	+283.0
	floppy disk	5	23	+360.0
	compact optical disk	1	5	+400.0

SOURCE: GAO Survey of Federal Information Users, 1988.

tion is already significant for some types of information and is projected to expand considerably over the next 3 years. For the 114 civilian departmental agency components responding, some key trends are indicated in Table 4-24.

While generalizations are difficult, the survey data suggest that, for several major types of Federal information, especially statistical data, scientific and technical reports/information, administrative reports, and press releases, about one-fifth to one-third of the executive branch agencies expect to have electronic dissemination available within 3 years. The dominant electronic formats vary by type of information. Probably one-tenth to one-eighth of the agencies expect to have electronic dissemination of other types of Federal information (e.g., pamphlets, manuals, regulations, directories). Overall, however, the survey data suggest that despite dramatic increases in electronic formats, paper will still be the dominant format for the near- to medium-term.

Opportunities and Challenges

These trends in technology, user demand, and agency activities present GPO with a number of challenges and opportunities. Principal among these are: electronic input, structured database standards, electronic publishing support, dissemination of electronic formats, staffing, and capital investment.

Electronic Input

As noted earlier, most Federal agencies already have the technology needed to originate materials in electronic form and capture the key strokes needed to initially enter the data and make subsequent revisions. Once the material is ready for composition and layout, and assuming the originating agency is not performing these functions, it is generally more cost-effective to transmit the data in electronic form to GPO so as to minimize any necessary rekeyboarding. The cost savings can be substantial. GPO estimates that rekeyboarding costs on average $35 to $50 per page, whereas electronic input costs $1 to $15 per page, depending on how much recoding and reformatting are needed. For electronic input materials using the GPO structured database standards, the average cost is $1 to $2 per page, since no rekeyboarding and minimal recoding or reformatting are needed.

Table 4-24.—Agency Activities and Plans for Electronic Information Dissemination, by Type and Format

Type of information	Format	Percent of agencies using		
		Now	Next 3 years[a]	Percent change
Administrative reports	Electronic mail	14.0%	26.3%	+87.9%
	Electronic bulletin board	0.9	8.8	+878.0
	Electronic data transfer	12.3	21.1	+71.5
	Magnetic tape/disk	6.1	11.4	+82.0
	Floppy disk	7.9	16.7	+111.4
	Compact optical disk	—	2.6	+
Scientific and technical reports/ information	Electronic mail	6.1	15.8	+159.0
	Electronic bulletin board	6.1	10.5	+72.1
	Electronic data transfer	14.9	18.4	+23.5
	Magnetic tape/disk	14.0	16.7	+19.3
	Floppy disk	8.8	16.7	+90.0
	Compact optical disk	—	8.8	+
Press releases	Electronic mail	13.2	28.1	+112.9
	Electronic bulletin board	5.3	12.3	+132.1
	Electronic data transfer	7.0	13.2	+88.5
	Floppy disk	3.5	7.0	+100.0
	Video tape	6.1	8.8	+44.3
Pamphlets/bulletins	Electronic mail	8.8	18.4	+109.0
	Electronic bulletin board	3.5	10.5	+200.0
	Electronic data transfer	4.4	13.2	+200.0
	Floppy disk	1.8	9.6	+433.3
Manuals	Electronic mail	0.9	9.6	+966.6
	Electronic bulletin board	0.9	5.3	+488.9
	Electronic data transfer	3.5	11.4	+225.7
	Floppy disk	5.3	14.0	+164.2
	Compact optical disk	—	3.5	+
Decisions/opinions	Electronic mail	2.6	10.5	+303.9
	Electronic bulletin board	—	5.3	+
	Electronic data transfer	2.6	9.6	+269.2
	Magnetic tape/disk	0.9	4.4	+388.9
	Floppy disk	2.6	6.1	+134.6
Rules, regulations, directives, circulars	Electronic mail	8.8	18.4	+109.1
	Electronic bulletin board	0.9	6.1	+577.8
	Electronic data transfer	2.6	10.5	+303.9
	Floppy disk	6.1	12.3	+101.6
Directories/catalogs/bibliographies	Electronic mail	0.9	11.4	+1,167.0
	Electronic bulletin board	1.8	7.9	+339.0
	Electronic data transfer	8.8	18.4	+109.1
	Magnetic tape/disk	8.8	11.4	+29.5
	Floppy disk	5.3	14.9	+181.1
	Videodisk	0.9	3.5	+288.9
	Compact optical disk	—	7.9	+
Statistical data	Electronic mail	7.9	20.2	+155.7
	Electronic bulletin board	3.5	12.3	+251.4
	Electronic data transfer	17.5	25.6	+46.3
	Magnetic tape/disk	31.6	34.2	+8.2
	Floppy disk	19.3	31.6	+63.7
	Compact optical disk	—	2.6	+

[a] Calculated by adding the percentage of agencies now using the format indicated to the number of agencies who expect to use the format within the next 3 years. Assumes that agencies currently using a format will continue to do so.

SOURCE: GAO Survey of Federal agencies, 1987.

GPO already provides multiple options for electronic input, as noted earlier, including scanned input, floppy disks, magnetic tapes, dial-up telephone lines, and fiber optic lines. Some of these options could be refined and/or expanded.

GPO has scanners that can read most of the popular typewriter and word processor fonts and convert the material from alphanumeric characters to electronic form. However, the scanned copy must be very clear and legible in order to obtain a low error rate and, in any event, must be coded as well as scanned in order to produce a database for input to the GPO composition system. As a result, the cost of scanned input is higher than other purely electronic input modes but, when properly selected, can be much lower than rekeyboarding.

Scannable material is still a small percentage (about one-fifth) of all material in manuscript form received by GPO. As long as manuscript copy is submitted, the more that is scannable, the lower the costs. GPO could intensify efforts to advise agency customers of the scanner option and the typeface and format requirements. **GPO could also aggressively evaluate state-of-the-art scanner technology in order to increase the range of typefaces and fonts that can be scanned, and to simplify recoding to the extent feasible. Also, agencies which have their own scanners could be encouraged to do the scanning themselves and submit materials to GPO in floppy disk or other direct electronic format.** However, in the final analysis, scanners are much slower and more error-prone than direct electronic formats.

GPO has a floppy disk reader that is capable of reading over 100 different disk formats from a wide range of word processing systems. Agencies can submit their material on floppy disks, and the word processing codes for typeface and format used on these disks can be converted to GPO's structured database codes. Very few agencies currently make use of this option. **GPO could encourage greater agency use of floppy disk input, especially as a substitute for manuscript submission, which requires complete rekeyboarding.** GPO could also survey the Federal agencies to ascertain the types and distribution of word processing systems being used, and could add capability to existing GPO equipment to convert other kinds of disk formats used by agencies. Floppy disk conversion does require quality control on the part of the agencies to insure consistently error-free coding. Floppy disk input is generally best suited for shorter documents, cheaper than scanned input, but more expensive than magnetic tape input.

Magnetic tape input is the dominant mode used by executive agencies, and is used to a lesser, but still significant, extent by legislative branch agencies. **Magnetic tape represents a high speed, high volume, low cost per page way to transmit material from originating agencies to GPO for composition, typesetting, and printing.** Magnetic tapes can be provided to GPO in any of three formats: database tapes, direct drive tapes, and data tapes.

Database tapes are produced by the originating agency (or an agency contractor) using GPO's structured database specifications. These tapes require no code conversion and serve as input to the GPO composition system. GPO has been processing database tapes for nearly twenty years. The preparation of camera ready copy at GPO from database tapes is inexpensive, priced at $1.85 per page. The preparation of film negatives from data tapes costs $3.15 per page. Direct drive tapes are produced by the originating agency (or an agency contractor) using not only GPO's structured database specifications, but also GPO's electronic composition codes (with type face and page format already specified). Direct drive tapes provide direct input to GPO's phototypesetters, producing camera ready copy or film negatives. The preparation of camera ready copy or film negatives from direct drive tapes is $0.30 cheaper per page than from database tapes, at $1.55 and $2.85 per page respectively, and is a low-cost way of providing materials to GPO. The use of both database and direct drive tapes has increased in recent years, as indicated in Table 4-25.

These two forms of magnetic tape input are likely to continue at or above present levels for the forseeable future, so long as traditional ink-on-paper output formats are needed and GPO traditional printing services remain competitive. Some agencies have the capability to produce magnetic tapes, but do not have the

Table 4-25.—GPO Pages Produced from Database and Direct Drive Magnetic Tapes, Fiscal Years 1983-87

Fiscal year	Database tapes total pages	Direct drive tapes total pages
1983	392,162	350,723
1984	654,606	859,497
1985	769,791	781,398
1986	926,445	724,889
1987	807,507	838,545

SOURCE: U.S. Government Printing Office, 1988.

expertise or desire to code the tapes to GPO specifications. In these cases, GPO does not have to rekeyboard the substantive material, but does have to convert from agency codes to GPO's structured database standards and insert composition codes. These tapes are handled on a case-by-case basis similar to the floppy disks.

A final means of input to be discussed here is electronic transmission via dial-up telephone lines, fiber optic lines, satellite private lines, and the like. Conceptually, the originating agency keyboards the data on its own microcomputer or other terminal, electronically transmits the data via a telecommunications link to GPO for composition, and electronically receives the proof pages back from GPO via the telecommunications link for printout on a laser printer. Corrections can be made on the proof copy and electronically transmitted (or mailed) back to GPO, where the final pages are produced on GPO's phototypesetters. As of January 15, 1988, the organizations listed in Table 4-26 were using dial-up transmission for input and proofing of various publications.

While electronic transmission represents, at present, a small portion of total input to GPO, this use for electronic input is likely to grow significantly, especially if proven to be cost effective. The experience with the fiber optic transmission between the Senate Office of Legislative Counsel and GPO is illustrative. The Legislative Counsel uses a fiber optic link to transmit draft bills to GPO, where they are typeset and transmitted back to the Legislative Counsel's Office and proof copies are printed out on laser printers. During fiscal year 1987, 163,893 pages were transmitted in this fashion at a total GPO billable cost of $75,350, or about $0.46 per page. This appears to be a competitive price, although it presumably does not reflect any capital costs (such as the fiber optic link or laser printers) and does not include the GPO cost of printing copies of the bills in final form. Also, bills are very straight forward in format. While not strictly comparable, the average GPO per page composition cost for the *U.S. Code* using magnetic tape input was about $7.40 per page in fiscal year 1986 (6,158 pages at a total cost of $45,592). The U.S. Code is more complex and contains more characters per page than a bill, and bills usually go through several revisions. If one assumes three revision cycles for bills, with 4 bill pages equivalent to one *U.S. Code* page, the costs are similar.

Table 4-26.—GPO Dial-Up Electronic Transmission Customers, January 1988

Executive branch
- Department of Commerce
- Department of Housing and Urban Development
- Department of Transportation, Federal Aviation Administration
- Department of the Treasury, Customs Bureau
- Veterans Administration
- Office of Management and Budget
- Office of the Federal Register, Code of Federal Regulations

Legislative branch
- GPO—Daily Congressional Record, Record Index, Bills
- Library of Congress

House of Representatives
- Committee on Banking, Hearing
- Committee on the Budget, Hearing
- Committee on Energy and Commerce, Hearing, Committee Print
- Committee on Foreign Affairs, Committee Prints
- Committee on the Judiciary, Hearings
- Committee on Small Business, Hearings
- Committee on Veterans Affairs, Committee Print, Hearings, Report, Title 38 (U.S. Code)
- Sergeant At Arms, Notice
- Office of Legislative Counsel
- Office of the Clerk, Calendars, Lists, Stationary, Directory

U.S. Senate
- Committee on Veterans Affairs, Hearing
- Office of the Secretary, Document, Book, Senate Journal
- Office of Legislative Counsel

SOURCE: U.S. Government Printing Office, 1988.

Structured Database Standard

As mentioned in chapter 3, a structured database standard is a key aspect of overall standards development for electronic publishing and dissemination. GPO has developed and implemented what it calls a logically structured full-text database standard or specification, or simply a structured database standard for short. All this really means is that the database (containing textual, tabular, and/or numerical information) contains no coding unique to a specific word processing or typesetting system.

Data elements are tagged with an identifier that can be used to control the format of a particular document. Users who agree on and implement a common set of structured database standards are able to change the database easily and cost-effectively from one location to another, one format to another, and one revision to a later revision or edition.

GPO uses its own structured database standard for the vast majority of materials composed and produced at the GPO main plant. However, the GPO standard is not, at present, generally accepted by private industry and significant parts of the Federal Government. For example, DoD is committed to the Standard Generalized Markup Language (SGML) approach, which is similar to GPO's approach, but still a distinctly different standard. Many of the desktop and high-end electronic publishing systems located in Federal agencies use display oriented standards (what you see on the screen is what you get in the document) and/or structured database approaches different from GPO's.

GPO indicates that software could be written to convert SGML (or presumably any other markup language) automatically into GPO's logically structured full text database approach. Also, GPO is prototyping a desktop microcomputer-based version of its structured database software.

In sum, as noted in Table 4-27 there is significant use of GPO's database standard. But this percentage of use is only a small fraction of all government publications. This suggests a significant, unrealized opportunity to apply GPO's or some other approach as a broadly accepted and acceptable government wide database standard.

Electronic Publishing Support

Under the electronic GPO-decentralized alternative, GPO would need to develop an overall electronic publishing strategy that leverages GPO strengths to meet changing needs of the Federal agencies. This strategy is likely to differ for the executive and legislative branches of government. As presented in detail earlier, the executive branch has made and continues to make a major investment in electronic publishing and related technologies, typically as part of agency automation programs. While implementation varies widely, electronic publishing is conceptually viewed as part of agency information resources management (IRM), and staffing, budgeting, and the like are evolving within the IRM framework. Many agencies are committed to a transition from paper to electronic-based operations, although the transition is likely to take many years.

For the executive branch, several roles for GPO are emerging. First, GPO can continue to provide traditional printing services either at the well-equipped main plant or via outside procurement. Second, GPO can continue to improve cost-effectiveness at the input and prepress end of the printing process by encouraging electronic submissions, already at very high levels, and dial-up composition services, where appropriate. Third, GPO can encourage adoption of governmentwide structured database standards as discussed above. Fourth, GPO can provide or facilitate mechanisms for training and education about electronic publishing.

Table 4-27.—Departmental Applications of GPO Structured Full Text Database Standard, as of November 1987

Department	Number of publications or publication series using GPO standard
Agriculture	12
Air Force	4
Army	11
Commerce	38
Defense (other)	13
Energy	2
HHS[a]	23
Interior	7
Justice	3
Labor	8
Navy	15
Transportation	11
Treasury	10
State	6
Total	163

[a] Health and Human Services

SOURCE: U.S. Government Printing Office, 1988.

On the one hand, GPO's greatest assets are its traditional printing facilities and labor force, coupled with a substantially automated prepress capability, including electronic photocomposition and typesetting. GPO is well suited for agency work requiring typeset quality ink-on-paper output, for large documents and long press runs, and for a variety of specialty jobs. GPO's structured database standard, or some variation thereof, is well suited to provide cost-effective linkages between document origination, revision, and multi-format dissemination, regardless of who is doing the disseminating. On the other hand, many of the executive agencies are committed to acquiring and implementing their own electronic publishing and dissemination capability, largely as part of agency automation programs in which GPO has little or no involvement. Some agencies, and especially the defense and regulatory agencies, are determined to reduce their dependence on paper drastically within the next few years.

The plans and activities of defense agencies are particularly important, since, as shown in Table 4-28, the Army, Navy, and Air Force together account for about $250 million in GPO billings or roughly one-third of total GPO billings. The Navy, for example, has established the "paperless ship" as a prime directive. All military services are hoping to place most manuals, directives, and technical documentation on electronic media for filing, revising, updating, and disseminating.

Table 4-28.—Ten Largest GPO Printing Customers, Fiscal Year 1986

Customer	Fiscal year 1986 billings: Dollars in millions	Fiscal year 1986 billings: Percent of fiscal year 1986 total[a]
Army	134.7	18.3
Navy	74.6	10.1
Congress	68.0	9.2
Treasury	65.6	8.9
Postal Service	53.0	7.2
HHS[b]	49.8	6.8
Air Force	48.0	6.5
GSA	23.0	3.1
Agriculture	21.8	3.0
Energy	19.3	2.6

[a] Percent of fiscal year 1986 GPO total revenues of $737 million net of publications sales, appropriations, and reimbursements.
[b] Health and Human Services.

SOURCE: U.S. Government Printing Office, 1988.

GPO's high dependence on printing for defense customers is concentrated at several of the regional procurement and printing facilities, as shown in Table 4-29. In the extreme case that most traditional ink-on-paper defense work was phased out (over a period of several to many years), only the GPO main printing plant, rapid response center, Chicago, Denver, New York, and San Francisco regional printing plants, and Denver and Seattle regional procurement offices would be substantially unaffected. All other offices could lose between

Table 4-29.—Distribution of GPO Defense Customers by Procurement and Printing Offices, Fiscal Year 1986

	Total Defense Agency billings, fiscal year 1986[a]: Dollars in millions	Total Defense Agency billings, fiscal year 1986[a]: Percent of office total[b]
Procurement offices		
Boston Regional	3.3	69.9
Philadelphia Regional	27.0	84.8
New York Regional	7.3	58.2
Hampton Regional	19.5	89.7
Atlanta Regional	23.7	71.1
Chicago Regional	21.8	73.6
Columbus Regional	8.3	68.3
St. Louis Regional	12.0	70.4
Dallas Regional	13.7	61.4
Denver Regional	3.5	23.7
Los Angeles Regional	7.1	77.0
San Francisco Regional	7.1	52.7
Seattle Regional	2.7	26.4
San Antonio Satellite	2.6	95.6
Charleston Satellite	1.1	85.2
San Diego Satellite	0.2	99.4
Oklahoma City Satellite	0.07	100.0
Rapid Response Center	1.2	9.7
Printing Offices		
Chicago Regional	0.02	1.0
Denver Regional	0.1	4.8
New York Regional	0.5	34.3
San Francisco Regional	0.1	16.8
Seattle Regional	0.2	59.6
Rapid Response Center	1.4	15.5
Main Plant		
Procurement	63.6	19.3
Printing	17.2	9.3

[a] For Army, Navy, Air Force, Defense Logistics Agency, and Other Defense Agencies.
[b] Defense agency billings calculated as a percentage of total billings for each Office.

SOURCE: U.S. Government Printing Office, 1988.

half and over 90 percent of current billings, all other things being equal.

Clearly, then, an important part of GPO's electronic publishing strategy would logically be a very careful analysis of how defense automation activities are likely to affect the demand for traditional GPO printing services over what time frame, and what are the leveraged opportunities for GPO with respect to the emerging defense electronic information infrastructure.

Such an analysis would require, first, that GPO obtain basic information about defense agency automation plans. Up to now, GPO has directly participated in only a handful of defense automation programs, including the Army Programs 600-S (terminated before contract award) and 400-S (contract awarded in 1984) and the Air Force Program 50-S (contract awarded in 1988). However, these three electronic publishing programs represent only a fraction of all relevant DoD activities. For example, GPO did not participate in the Navy's "Printing on Demand System" designed to produce 15,000 15-page documents per day on an electronic printing-on-demand basis.

In addition to keeping more fully informed on agency automation activities (both military and civilian), GPO could establish an electronic publishing laboratory and innovation center for both GPO and agency personnel. GPO already has taken some action along these lines with respect to establishment of the "dial-up composition service" now available. This service permits agencies to originate material from agency microcomputers, transmit the material over telephone or fiber optic lines to GPO for typesetting, and receive the typeset material via transmission back to the agency for printing of proof copies on agency laser printers. This dial-up service uses GPO's logically-structured database, and GPO provides both a demonstration room and a training program.

This concept could be expanded to a much wider range of electronic publishing applications, including high-end and optical disk configurations. From a strategic perspective, GPO would benefit from staying abreast or, perhaps, ahead of agency applications and thereby be in a much better position to identify opportunities to meet agency needs. In a decentralized and competitive electronic environment which increasingly characterizes the Federal Government, GPO will have to be innovative in matching its expertise with agency needs. Agency needs will vary over a wide spectrum and will change over time at an increasingly rapid pace. Some agencies will look to GPO for a wide range of electronic publishing services, assuming such services are available, while others will be completely independent of GPO, regardless of what GPO offers.

At this point in time, it is not possible to determine with precision the extent of agency needs for GPO electronic publishing services. In 1986, GPO conducted its own survey of agency needs. The results (based on 175 of 850 questionnaires returned—a 20 percent response rate) strongly indicate that almost all agencies will be using electronic publishing within 5 years, especially for reference materials, technical documentation, and periodicals, but the role of GPO is much less clear. Roughly one-fifth to one-quarter of the respondents indicated a near-term preference for GPO automatic composition, computer-aided page makeup, and typeset quality output, increasing to about one-third of the respondents in 5 years. This compares to the roughly two-thirds of the respondents who indicated an overall intent to use these electronic publishing services in 5 years. This suggests that perhaps up to about one-half of these types of agency electronic publishing work might be done by GPO, and the other half by the agencies themselves (or by agency contractors). The results suggest a relatively smaller role for GPO with respect to text input and editing, electronic display, data telecommunicating, and computer generated graphics, although the overall use of these GPO services was still projected to grow significantly.

The response rate to this 1986 survey was low, and both agency and GPO activities—as well as the underlying technologies—have changed markedly since then. Clearly, a new survey is needed and hopefully with a much higher response rate. Some highlights from the 1986 survey are shown in Table 4-30.

Several of the agency respondents indicated in written comments that use of GPO electronic publishing services would depend in large part on whether such services were cost-effective compared to in-house costs or commercial rates. In essence, GPO is competing for agency electronic publishing business against agency inhouse, contractor, and commercial vendor alternatives. GPO is already moving to provide more electronic publishing options, but the pace is still much slower than the rates of change in technology, agency activities, and user needs.

While GPO training and innovation activities are relevant to all branches of government, the role of GPO with respect to legislative branch electronic publishing could be different in several key ways. First, the legislative branch has not yet made the major capital investment in the technical infrastructure that makes decentralized executive branch activities a reality. Second, the legislative branch generally does not have a large number of staff already trained in electronic publishing. Third, GPO is in the legislative branch, so separation of powers concerns do not apply. Fourth, GPO already has a central role in many legislative branch publishing activities. And fifth, many of GPO's own pilot projects involve the legislative branch, such as the fiber optic links between GPO and the Senate Office of Legislative Counsel, House Office of Legislative Counsel, and House Information Systems Office (HIS).

For all of these reasons, GPO could develop plans for an expanded role with respect to the legislative branch. These plans could include the GPO provided capability for congressional committees and offices to search, retrieve, and print-on-demand key governmental process documents such as the *Congressional Record, Record Index*,

Table 4-30.—Federal Agency Electronic Publishing Activities and Plans, as of 1986 in Percent of Agencies Responding

Types of documents for which electronic publishing is/will be used	Currently		In 5 Years
Reference Materials	35%		57%
Technical documentation	37		56
Periodicals	26		48
Throwaways	21		36
Catalogs	14		31
Legal documentation	10		20
Electronic publishing services that are/will be used	**Currently**	**Next year**	**In 5 years**
Text input and editing (microcomputers, word processors)	75%	82%	87%
Automatic composition (software/systems)	25	40	56
Computer generated graphics	42	59	77
Computer-aided page makeup	17	34	61
Typeset quality output	34	45	57
Electronic display	33	43	58
Data telecommunicating	43	54	68
GPO electronic publishing services that will be used		**Next year**	**In 5 years**
Text input and editing		9%	14%
Automatic composition		19	28
Computer generated graphics		14	20
Computer-aided page markup		22	30
Typeset quality output		29	38
Electronic display		11	16
Data telecommunicating		13	18

SOURCE: U.S. Government Printing Office, 1988.

***Federal Register* and *Code of Federal Regulations*, all of which are already in an electronic structured database format.** This concept could be extended to include the capability to search, retrieve, and print-on-demand selected committee prints, reports, and hearings, although the degree of difficulty would be considerably greater since little of this material is currently in structured database format. This problem could be gradually eliminated over time if more committees utilized GPO's electronic database and photocomposition capability, either on a dial-up or floppy disk basis. These alternatives will become more widely possible as the penetration of microcomputers on Capitol Hill continues. Any detailed planning along these lines would need to take into account the inevitable increase in desktop publishing (software has decreased to the $600 per unit range) and the complementary roles of GPO, the Library of Congress, HIS, and the Senate Computer Center.

Dissemination of Electronic Formats

Under the "Electronic GPO-Decentralized" alternative, SupDocs would select agency electronic format information products for inclusion in the GPO sales program, presumably based on an evaluation of sales potential. Agencies could sell such products as well, but could also opt, at agency discretion, to use SupDocs as their sales outlet.

At the present time, SupDocs includes only a few dozen magnetic tape products in the sales program. These tapes are sold at the usual cost plus 50 percent (in accordance with Title 44 of the U.S. Code) and include, for example, the *Congressional Record*, *U.S. Code*, *Code of Federal Regulations*, *Federal Register*, *Statistical Abstract of the U.S.*, *Budget of the United States*, *Weekly Compilations of Presidential Documents*, and *U.S. Government Manual*. At the moment, these magnetic tape products are sold primarily to commercial information vendors—such as Mead, WESTLAW, DIALOG, Legi-Slate, Congressional Quarterly, and BRS —which repackage or enhance and resell the information.

GPO planning for an expanded offering of electronic formats would need to take into account questions of demand, economies of scale, cost, private sector competition, and marketing. The results of the GAO surveys of Federal information users clearly indicated a growing demand for electronic formats, as discussed earlier. As part of these surveys, GAO also asked respondents to estimate the usefulness of a variety of online and offline Federal information formats. The depository library community indicated the strongest positive response, with a clear majority of respondents finding the illustrative items to be useful. These results (based on responses from 318 depository libraries, out of a sample of 451) are summarized in Table 4-31 and the number of libraries rating each item as moderately useful, useful, or greatly useful out of the total respondents for that item. The remaining percentages (not shown in Table 4-31) include those libraries rating the item as somewhat useful or having little or no use. The respondents were asked to reply irrespective of how the formats might be provided (e.g., by the Federal Government, commercial vendors, and/or not-for-profit organizations).

The depository library results suggest very strong demand for the *Congressional Record*, calendars and bill status, the *Federal Register*, an index to Federal information, and an integrated database in both online and offline electronic formats. Demand for agency press releases and reports is weaker. In terms of intensity of demand, as measured by the percentage of libraries rating these items as greatly useful, the results indicate the highest rankings for the index and integrated database (online and offline) followed by the *Register* (online and offline), committee calendar and bill status (online), and *Record* (online and offline).

The information needs of depository libraries could, of course, be met to some extent through DLP, as discussed in detail in chapters 6 and 7. However, the depository libraries serve as a good indicator of demand among library and information science professionals and those groups in American society that are the most information-intensive.

Table 4-31.—Depository Library Demand for Federal Information Electronic Formats

	Percent of libraries responding moderately to greatly useful	
Item	Online immediate access	Offline CD-ROM issued monthly
Congressional Record	77	74
Committee Calendar and Bill Status	70	60
Federal Register	86	80
Federal Agency Press Releases	46	40
Agency Reports	61	62
Comprehensive Index to Federal Information	94	90
Integrated Database of Key Federal Statistical Series	90	88

SOURCE: GAO Survey of Federal Information Users, 1988.

GAO also surveyed scientific and technical associations and general associations (trade, professional, consumer, etc.). The results (based on 133 responses from a sample of 250 scientific and technical associations, and 134 out of 350 general associations) are similar to those of the depository libraries, but with a considerably lower level of intensity. In other words, while the relative preferences for various types of electronic information formats were roughly the same, the overall percentages of respondents rating the items as moderately to greatly useful were about half to three-quarters that of the libraries for online access, and about one-third to one-half for offline access. The survey results for the associations are highlighted in Table 4-32.

All categories of respondents indicated that the index and integrated database would be the most useful among the items included in the survey. Unlike the depository libraries, which indicated little difference in usefulness of online versus offline formats, the associations showed a clear preference for online electronic formats. This may reflect, in part, differences in the nature of demand. For example, researchers using libraries may have a less urgent need for some types of Federal information and, therefore, might find monthly CD-ROMs to be adequate. Many associations may be primarily concerned with only the latest, up-to-the-minute information that necessitates online access. It is also probable that the associations are less familiar with CD-ROM technology than the libraries. Indeed, relatively few associations reported having access to CD-ROM readers compared to the libraries, as indicated in Table 4-33.

Clearly, depository libraries have better access to all categories of technology listed except mainframe computers. Scientific and technical associations have generally better access than the general associations, with the exception of microfiche readers, CD-ROM readers, and videodisk players, where the groups of associations are about equal.

The implications for SupDocs are several. First, there does appear to be an already significant demand for electronic formats, but, second, this demand at the moment is somewhat ahead of the actual technical capability of users, especially with respect to CD-ROM. Taking all survey groups together, online demand ranges from 34 to 94 percent of respondents while microcomputer with modem capability ranges from 54 to 83 percent. Offline CD-ROM demand ranges from 22 to 90 percent, but CD-ROM reader capability ranges from only 6 to 41 percent. However, third, continually declining equipment costs mean that the gap between user demand and technical capability is likely to close rather rapidly. Microcomputers cost $1,500 or less, modems about $300, and CD-ROM readers about $700.

For types of information where a demand has been established, SupDocs would need to determine if including a particular item in the sales program would be cost-effective and competitive relative to any other alternatives that

Table 4-32.—Scientific, Technical, and General Association Demand for Federal Information Electronic Formats

	Percent of associations responding moderately to greatly useful			
	Scientific and technical associations		General associations	
Item	Online immediate access	Offline CD-ROM issued monthly	Online immediate access	Offline CD-ROM issued monthly
Congressional Record	34%	22%	53%	39%
Committee Calendar and Bill Status	39	23	54	36
Federal Register	40	27	55	41
Federal Agency Press Releases	52	30	54	36
Agency Reports	54	33	53	40
Comprehensive Index to Federal Information	71	43	60	43
Integrated Database of Key Federal Statistical Series	63	42	63	43

SOURCE: GAO Survey of Federal Information Users, 1988.

Table 4-33.—Library and Association Access to Information Dissemination Technology

	Percent of libraries or associations responding		
Technology	Depository libraries	Scientific and technical associations	General associations
Microcomputer	70%	64%	51%
Microcomputer with modem (for online access)	83	65	54
Microfiche reader	88	24	22
Microfiche reader with printer	96	18	12
CD-ROM reader	41	6	6
Videodisk player	17	11	12
Mainframe computer (for tape/disk access)	37	36	27

SOURCE: GAO Survey of Federal Information Users, 1988.

may be available to users. For many types of Federal information, individual agencies and private sector vendors might decide to market electronic formats. In other words, SupDocs would be operating in a more competitive environment than has traditionally been the case with respect to paper formats. Thus, for example, at present the Bureau of the Census sells paper formats via the SupDocs sales program, but sells magnetic tapes and floppy disks itself and also offers online electronic bulletin board services. Both the Bureau of the Census and private vendors are developing CD-ROM products, and some Census CD-ROM products will be disseminated as part of DLP.

The approach taken by SupDocs in deciding what to include in the sales program could vary depending on the particular information product. Some items, such as a governmentwide information index, could be developed by SupDocs and/or NTIS, have an apparently broad demand, and could be sold in both online and CD-ROM formats. SupDocs would need to determine if electronic format products could be produced and sold at an acceptable price. For example, most depository library respondents to the GAO survey indicated that they would be willing to pay no more than $49 per hour online and $199 per CD-ROM for access to a governmentwide index. However, most of the associations responding indicated that they would be willing to pay no more than $24 per hour online and $19 per CD-ROM. OTA has not done a detailed analysis of this data, but $24 per hour online is in line with non-profit rates for similar information products. And $19 (or less) per CD-ROM is realistic at production volumes of over 1,000 or so disks. If the index on CD-ROM were distributed to depository libraries, this would guarantee a base volume of about 1,400 disks. Initial demand for a CD-ROM index product could easily be in the several thousands, based on the GAO survey response. Again, since the index information would not be copyrightable, and assuming the electronic master tape (or the equivalent) would be available for purchase, private companies could put the index up as a file on DIALOG and similar value-added database services, and even could add value and sell an enhanced CD-ROM product.

In general, CD-ROM products can be produced at low unit costs at volumes over 500 to 1,000 disks. Thus, there would likely be a growing number of opportunities for SupDocs to "ride" the order for production of agency CD-ROMs, where a sufficient market exists, just as SupDocs now rides the agency orders for printed ink-on-paper products. Presumably, the mastering and duplications of CD-ROMs would be contracted out to the private sector, by either the agency or GPO, at least until such time that inhouse government capability might be more cost-effective.

As for other formats, the market for magnetic tapes is probably not going to be large in the forseeable future, due to the need to have a mainframe or minicomputer and related peripheral equipment. Major customers are likely to continue to be the value-added vendors and scientific or research organizations. Government experience to date (at GPO and various agencies) is that sales in the hundreds of copies per year are considered good. Similarly, sales of floppy disks to date by NTIS and various agencies have been minimal. Floppy disks can be produced at only $1 to $5 dollars per unit, compared to about $100 to $200 for magnetic tapes (depending on bit density). Also, floppy disks can run on the increasingly commonplace microcomputers. Thus, the potential market for floppy disks would appear to be large compared to magnetic tapes. However, detailed market analyses are needed to establish reliable estimates.

Perhaps the most difficult format for SupDocs could be online. Whereas SupDocs could ride the agency orders for CD-ROMs, magnetic tapes, and floppy disks, regardless of where and by whom the copies were produced, it is hard to conceptualize riding an online database. It seems unlikely that, as a general rule, agencies and SupDocs would be offering the same online databases. SupDocs could offer agency online databases at agency discretion, or could offer a gateway to agency databases. Also, SupDocs could contract with a private commercial (or non-profit) gateway service. Further, private gateway or value-added database companies could contract directly with individual agencies and/or purchase the magnetic tapes, as some do today.

On the other hand, SupDocs could serve as the primary Federal outlet for online access to key governmental process information items such as the *Congressional Record* and *Federal Register*. These kinds of items are all well suited to online format because the information is frequently time sensitive and of selective interest. That is, many users are not interested in reading these documents cover to cover at their leisure, but, instead, want to quickly search for and retrieve information on selected topics of interest. The GAO survey results suggest that there would be broad demand for these items if priced below $24 per hour. Since items such as the *Record* and *Register* are bought by vendors in magnetic tape format from SupDocs and then put online and sold at a significant mark-up, it seems plausible that SupDocs could itself offer these items online at a competitive price. SupDocs could, of course, itself contract with a private gateway or database vendor. SupDocs offerings would not necessarily have any significant impact on private services, since the markets served may be quite different. Again, detailed feasibility and marketing studies would be needed.

Overall, the development of a rational and workable plan for SupDocs sales of electronic formats would require close consultation and coordination with mission agencies and especially those agencies that already have clearinghouse or gateway functions for electronic formats, such as NTIS and NLM. NTIS currently serves as a clearinghouse for some agency floppy disk and magnetic tape products, and NLM currently offers several agency online database services. For paper formats, SupDocs has included in the sales program primarily items judged to have significant demand, given the economics of traditional printing which penalizes small press runs and given the need to spread overhead, processing, and marketing costs over as large a sales volume as possible. However, some electronic formats could be economically viable at much lower sales volumes. To the extent SupDocs might seek to include low demand and perhaps even printing-on-demand items in the sales program, then SupDocs would be taking on NTIS-like functions. This would intensify the need to consider SupDocs-NTIS relationships, as will be discussed in chapter 5 and 12 in more detail.

Staffing

GPO faces two major challenges with respect to staffing: retaining the necessary skilled labor force to maintain traditional printing services at a level commensurate with demand, and obtaining personnel with the new skills needed to implement GPO's future role in electronic publishing and electronic information dissemination, however that role may be defined.

As noted earlier, GPO has a relatively old labor force, with about thirteen percent of all current employees eligible for retirement (and up to 25+ percent in some key areas). With a natural attrition rate of 5-10 percent (retirements and quits), GPO has considerable flexibility to reshape the labor force to match future needs. About 80 percent of the GPO labor force is unionized and works under collective bargaining agreements. The twenty union bargaining units and the approximate number of employees in each are listed in Table 4-34.

Table 4-34.—GPO Union Bargaining Units, as of April 1987

Bargaining unit	Number of employees[a]
American Federation of Government Employees (AFGE) Local 2876/Printing Crafts Joint Council (Main Plant White Collar Workers)	1,327
Washington Federal Printing Workers' Union (Member of GCIU see below) Local 713-S (Printing plant workers)	1,020
Columbia Typographical Union Local 101 (2 units, Composers and Rapid Response Center)	672
Graphic Communications International Union (GCIU) Local 4-B (2 units, Bookbinders and and Journeymen Bindery)	247
Washington Printing and Graphic Communications Union (member of GCIU) Local 1-C (2 units, Pressmen and Masonry Workers)	232
GCIU Local 285 (Offset Strippers)	138
Washington Government Photo Offset Union (member of GCIU) Local 538-C (Offset Platemaker Strippers)	69
AFGE Local 3392 (Pueblo Distribution Center)	67
International Brotherhood of Electrical Workers (IBEW) Local 121 (Electricians and Sanitary Engineers)	65
AFGE Local 2738 (Police)	62
AFGE Local 1248 (Denver Printing Plant)	42
International Association of Machinists Local 2135 (Machinists)	36
AFGE Local 1292 (Chicago Printing Plant)	27
Sheetmetal Workers' International Union Local 100 (Sheet Metal Workers and Pipe Fitters)	21
United Brotherhood of Carpenters and Joiners of American, Local 2456 (Carpenters)	17
AFGE Local 2618 (New York Printing Plant)	14
Brotherhood of Painters and Allied Trades, Local 1632 (Painters)	9
Total	4,065

[a] Number of employees represented by their union; not all employees represented are union members.

SOURCE: U.S. Government Printing Office, 1988.

Collective bargaining has been able to accommodate major changes in the size and job structure of the GPO labor force over the past fifteen years, responding in large part to technological change in composition, prepress, and press tech-

nology. Collective bargaining should be able to accommodate future changes, so long as labor and management work closely together and bargain in good faith.

At the moment, one possible impediment to successful labor-management relations, as pointed out by OTA's independent labor consultant, is the absence of a clear strategic vision of GPO's future role. The lack of a clear vision not only contributes to employee uncertainty, but makes staffing decisions difficult. It seems likely that, absent major changes in GPO's traditional printing role as discussed earlier, GPO should be able to continue its policy of no involuntary reductions in force (governed by a May 1982 resolution of the Joint Committee on Printing). Any reductions in the traditional labor force should be able to be handled through retirements and reassignments. It also seems likely that, if GPO pursues a significant role in electronic publishing and dissemination, GPO would need to bring in new skills from outside. While some existing personnel undoubtedly could be retrained for new jobs involving electronic processes and formats, as has been done in the past, some new personnel with advanced engineering, technical, and marketing education and experience would be required. The exact skills mix of retrained personnel and new hires cannot be determined in the absence of an overall strategic plan.

Capital Investment

Another important element of GPO's overall strategic plan would be capital investment alternatives. Again, a detailed capital investment program would require a well developed strategic plan. Short of that, it would seem prudent for GPO to reevaluate carefully its capital investment plans in light of possible adjustments to traditional printing services and possible new initiatives in electronic publishing and dissemination.

As discussed earlier, GPO has already substantially updated its main plant press and bindery equipment. The major outstanding item is the pending purchase of two new web offset presses for the printing of the *Congressional Record* and *Federal Register* at an estimated cost of about $10.5 million for the two units. OTA's independent printing consultant endorsed this capital investment on the grounds of improved efficiency and productivity. However, GPO's rationale for this investment presumes that traditional printing of the *Record* and *Register* will continue for at least 10 years substantially unchanged from today. As noted earlier, the *Record* and *Register* are well suited to online and offline electronic formats for which there is growing demand. Should Congress decide to make these publications available online and through CD-ROMs issued periodically to the legislative branch and depository libraries and on a sales basis via SupDocs, then it is conceivable that the paper format versions of the *Record* and *Register* could be reduced significantly in a few years. Indeed, the volume of paper copies could be reduced to the point where the large web offset presses would no longer be cost-effective. For example, even if paper copies were still provided to every Member, committee, and office of Congress, every depository library, members of the press, high-level executive officials, and Federal and State archival agencies, the required press run of several thousand copies could be uneconomical for the large presses.

GPO notes that a change of this magnitude would conflict with current provisions of Title 44 that require the printing and distribution of specified numbers of the *Record* and *Register*. However, electronic formats could be provided first as a complement to paper and eventually, after a transition period, as a substitute, and Congress could amend Title 44 if necessary. GPO also notes that any excess capacity on the two new web offset presses could be used to absorb workloads from other, older equipment, and to facilitate a gradual phaseout of some of that equipment. In addition, the new presses would be less labor intensive and would be technologically up-to-date. GPO and Congress need to carefully evaluate whether, even if electronic formats are encouraged or required, the remaining volume of paper copies is sufficient to justify use of the large web offset presses or, if not, whether the other advantages noted above would by themselves be compelling.

Future capital investment in the prepress, press, and bindery areas should also reflect any decisions on changing the work load distribution at the GPO main plant. The main plant carries out a much more diverse range of printing work than almost all private printing companies. GPO could consider some greater degree of specialization in order to help reduce indirect labor and overhead costs. (The fiscal year 1986 cost allocation for the main plant production department was about 31 percent direct labor, 34 percent section burden [indirect labor, materials, etc.], 28 percent overhead [general management and staff, utilities, rent, etc.], 2 percent depreciation, and 5 percent other [supplies, maintenance, etc.]). Presumably future capital investments would be made primarily in those areas designated as GPO specialities. Also, the shift to electronic formats for the *Record* and *Register* could further reduce indirect labor and general overhead since the overnight main plant operations could be scaled back although not eliminated, due to the continuing need for input to and creation of the online databases by the next day.

With respect to composition equipment, OTA's independent printing consultant concluded that GPO's current equipment is strongly competitive with private industry. GPO uses an ATEX minicomputer-based text editing system and Videocomp and Comp80 phototypesetters. As with press and bindery, the composition equipment has been substantially updated over the past decade, as highlighted in Table 4-35.

One area where GPO is not competitive is high-end electronic publishing equipment. The ATEX system is designed to handle large text files and is not well suited for smaller and specialty jobs involving complex layouts, graphics, and the like. To help meet this need, GPO established an Electronic Job Section equipped with Compugraphic and Bedford electronic publishing systems, among other equipment. The Bedford system, although two years old, is rarely used and is essentially obsolete. The Compugraphic system is used for fully processing about 60 percent of the work done in this section, and is used for partially processing (in conjunction with ATEX or other systems) another 35 percent of the work. While performance of the Compugraphic appears to be satisfactory, the now 3-year old system is obviously not state-of-the-art.

Table 4-35.—Selected GPO Electronic Composition Equipment,[a] Fiscal Year 1987

Equipment	Number of units	Year(s) acquired
Personal computers	12	1984-1987
Video display terminals	160	1978-1987
Multi processor control system	4	1983-1987
PDP 11-44 minicomputer	2	1981,1985
Floppy disk reader	1	1985
Text editing systems (ATEX)	16	1978-1987
Text editing system (Videocomp)	1	1986
Photocomposers (Videocomp, Comp 80)	4	1976-1981

[a]Excludes Electronic Job Section.

SOURCE: U.S. Government Printing Office, 1988.

In essence, GPO's capital investment strategy depends in part on whether GPO strives for (or is directed to take) a leadership role in electronic publishing technology. An effective leadership role probably requires a heavier investment in state-of-the-art technology, partly to learn about the technology for GPO's own purposes but, equally important, to also at least stay abreast of the mission agencies, some of which, at this point in time, are well ahead of GPO. For example, GPO has no significant activity underway in optical disk or compact disk technologies and expert information retrieval systems, and is behind the state-of-the-art in high-end electronic publishing work stations and software, all of which are under active testing or actually being implemented by various agencies.

With respect to the provision of online databases, GPO would need to decide whether existing computer capability would be adequate and, if not, whether to purchase or lease additional capability or whether to, at least initially, utilize the services of private sector value-added gateway carriers and database providers. For example, if SupDocs decided to sell the *Congressional Record* online, the *Record* could be established as a file on The Source, CompuServe, Easylink, and/or DIALOG. This would minimize GPO's capital investment requirements until experience with actual demand levels and patterns could be analyzed. Alternatively, or in addition, the online *Record* could be set up as a file on NLM's MEDLARS, on the gateway system operated by the Defense Technical Information Center, and/or on the library community's various networks. There are numerous possibilities, especially for key governmental process information such as the *Record* and *Register*. Eventually, SupDocs online information products could be made available via the FTS-2000, when implemented, and could make use of advanced satellite and fiber optic transmission technologies embedded in FTS-2000 and various commercial telecommunication systems.

In an era of constrained resources, GPO may have to make some difficult choices between investment in traditional versus electronic publishing technology, and between capital investment versus the training and recruitment of personnel to apply the technology. These decisions are best made within an overall strategic framework.

Chapter 5

An Electronic National Technical Information Service and NTIS/Superintendent of Documents Cooperation

Clockwise from top left: NTIS staff searching the NTIS database for a customer; NTIS staff "blowing back" from microfiche to produce a paper copy of a technical report; NTIS staff reproducing additional shelf stock; and NTIS staff pulling an archive document from the NTIS collection (photo credits: National Technical Information Service).

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Chapter 5

An Electronic National Technical Information Service and NTIS/Superintendent of Documents Cooperation

SUMMARY

This chapter discusses the current status of and future prospects for the National Technical Information Service (NTIS), and opportunities for cooperation between NTIS and GPO's Superintendent of Documents (SupDocs). The debate over the privatization of NTIS is discussed in chapters 11 and 12. The discussion in this chapter assumes that this debate will be resolved by Congress in favor of retaining NTIS within the Federal Government—as a separate agency or government corporation within the Department of Commerce or consolidated with SupDocs or even with the Library of Congress. The major challenge facing Congress is defining a viable role for NTIS in the future. A variety of indicators strongly suggest that the current role may not be sustainable absent some significant changes.

NTIS operates in a highly constrained environment, characterized by ambivalent support from the executive branch, limited financial resources, mixed support from the information industry, limited technical resources, and a difficult product mix (many low volume items). In addition, the basic demand for NTIS products appears to be significantly eroding. Most NTIS users and client agencies believe in the NTIS concept and seek to find ways to strengthen NTIS or at least the core NTIS functions as a continuing element of the Federal Government.

NTIS appears to be ideally suited for the implementation of an electronic document system (with multi-format output—paper, microfiche, or electronic), regardless of organizational location. NTIS could use a version of the Defense Technical Information Center (DTIC) system as a prototype. An electronic document system could help revitalize NTIS if coupled with improved agency participation. Overall, an electronic NTIS should be able to increase the diversity and timeliness of NTIS (and related private vendor) offerings, increase the ability of NTIS (and private vendors) to match information products with potential users, and reduce the cost of NTIS products. An electronic NTIS should be better able to serve all users, but especially small and medium businesses and individual researchers.

NTIS/SupDocs cooperation could create new opportunities for improvements in the indexing, marketing, and international exchange of Federal information. NTIS/SupDocs cooperation could be synergistic with respect to implementing an electronic document system that would meet NTIS needs plus a broadening of the SupDocs product line to include selected low demand items. The NTIS/SupDocs combined low-demand sales volume could help justify investment in the necessary equipment, which could be funded out of the GPO revolving fund and/or NTIS retained earnings (if authorized) and charged back as depreciation. NTIS/SupDocs cooperative initiatives would need to be sensitive to concerns about separation of powers between the executive and legislative branches, and about the strengthening of governmentwide dissemination mechanisms at the possible expense of decentralized agency activities.

Regardless of the ultimate institutional structure, there are significant opportunities for improvement in both NTIS and SupDocs product line analyses, development, and marketing. Strengthened cooperation between NTIS and SupDocs would not only help identify mutually advantageous joint activities, but would seem almost mandatory to the extent that both agencies pursue sales of electronic format products and that SupDocs enters the low-demand market.

ROLE AND CURRENT STATUS OF NTIS

The primary role of NTIS is to serve as a central governmentwide source of scientific and technical reports describing research performed by Federal agencies, contractors, and grantees. NTIS depends on the voluntary submission of these reports by the Federal agencies. NTIS maintains a permanent archive of these reports, establishes bibliographic control over these materials, prepares various index and abstract materials, and sells copies of the reports. In recent years, NTIS has increased its collection to include additional reports prepared by state and local governments and by foreign government research organizations, and to include Federal databases and software.

In addition to the basic archival and clearinghouse functions, NTIS is responsible for:

- the Federal Research in Progress (FEDRIP) Program that provides information describing on-going Federally funded research projects;
- the Center for the Utilization of Federal Technology (CUFT);
- acquisition and licensing of government-owned patents;
- provision of production and billing/collection services for information dissemination activities of other Federal agencies; and
- provision and processing of FOIA requests for agency materials placed on file at NTIS.

This discussion focuses primarily on the NTIS archival, clearinghouse, and dissemination functions.

As of fiscal year 1987, the NTIS archive included close to 2 million reports and over 2,500 data and software files. About 60,000 to 70,000 new items are added each year. About half of the NTIS reports originate from just three agencies: the Department of Defense (Defense Technical Information Center (DTIC)), the Department of Energy (DOE) (primarily the DOE Office of Scientific and Technical Information (OSTI)), and National Aeronautics and Space Administration (NASA) (primarily the NASA Scientific and Technical Information Facility (STIF)). The percentage distribution is shown in Table 5-1.

Table 5-1.—Source of NTIS Reports, Fiscal Year 1987

Agency	Percent of total
Department of Defense	23
Department of Energy	23
NASA	4
All other Federal agencies	20
Non-Federal agencies	5
Foreign countries	25
Total	100

SOURCE: National Technical Information Service, 1988.

NTIS operates under several constraints. One is the variable and limited funding commitment of the government to NTIS. NTIS began in 1945 as the Publication Board. The Publication Board was established by Executive Order 9568, which charged the Board with reviewing all government-generated scientific and technical documents and determining what could be released to the public. Executive Order 9604 expanded the Board's responsibilities to include scientific and technical documents captured from the enemy during and at the end of World War II. The Board's objectives were to organize declassified information so as to permit researchers, and especially industry, fast and easy access to information, and to notify the public and industry about what was available. The intent was to promote economic growth and development through the rapid dissemination of scientific and technical information.

Since established, questions have been raised concerning the appropriate functions and funding for NTIS. The Publications Board became part of the Office of Declassification and Technical Services (OTS) in late 1945, the Office of Technical Services in 1946, the OTS Clearinghouse in 1950, the Clearinghouse for Federal Scientific and Technical Information in 1964, and NTIS in 1970. The history of NTIS has reflected uncertainty on the part of the Federal Government as to the appropriate Federal commitment to a central clearinghouse for dissemination of scientific and technical information, the role of the clearinghouse vis-a-vis the Federal science agencies and the private sector, and the appropriate pricing of such clearinghouse services.

In general, representatives of the scientific and technical community believe that the cost of such clearinghouse services is a very small price to pay compared to the substantial Federal investment in research and development. To place this in perspective, the fiscal year 1987 NTIS revenues and costs were about $22 million each (breakeven operation) compared to the fiscal year 1987 Federal research and development budget of about $59 billion. Excluding defense R&D, the NTIS operating budget of $22 million represents about one one-thousandth of the civilian R&D budget ($21.5 billion in fiscal year 1987). Advocates of a strong Federal role in dissemination of scientific and technical information argue that the level of Federal support is far too small. Others believe that, while a Federal role is needed, it should be limited in terms of functions and budget.

The result is that NTIS receives no appropriated funds for its basic archival and clearinghouse functions, with costs covered by sales of documents and services. NTIS does not have a working capital revolving fund. As a consequence, since any net revenues must be returned to the U.S. Treasury, it has proven difficult for NTIS to obtain up-to-date equipment—especially modern information technology.

A second major constraint is that NTIS has a voluntary relationship with the source agencies and cannot require agencies to submit materials. NTIS estimates that more than one-third of Federal scientific and technical reports are never submitted. There is also concern that agencies may delay submission of key reports and/or submit primarily reports with less perceived interest or demand. NTIS functions, for the most part, as a secondary distributor of Federal scientific and technical information. The key Federal science agencies, such as DoD, DOE, and NASA, have their own mechanisms for direct dissemination of reports to agency personnel and contractors. NTIS then makes secondary distribution to the business community and general public. In addition, the GPO SupDocs includes some scientific and technical reports in the SupDocs sales program. NTIS includes some GPO titles in the NTIS clearinghouse. However, the overlap is thought to be small, since SupDocs selects titles based on significant market potential (projected sales of several hundreds to thousands of copies), whereas almost all NTIS includes titles are included regardless of demand, which is generally very small (an average sales of 10 copies per title). In sum, NTIS must achieve breakeven operations working with a substantially incomplete collection of reports that sell very few copies on the average. This is a difficult challenge.

A third major constraint is a complex relationship with the private sector and the information industry in particular. On the one hand, NTIS was established to help serve the scientific and technical information needs of business and industry. NTIS estimates that about 75 percent of its business customers are small firms, with major corporations accounting for the other 25 percent of business customers. Overall, the U.S. business community accounts for about two-thirds of NTIS sales, as shown in Table 5-2.

The information industry appears to be generally comfortable with the NTIS archival function and clearinghouse activities with respect to dissemination of paper and microfiche copies. However, NTIS initiatives with respect

Table 5-2.—Distribution of NTIS Sales, Fiscal Year 1987

Customer	Percent of NTIS sales, fiscal year 1987
U.S. business	64
Foreign (business and government)	20
U.S. Federal and State government	6
Academic researchers/institutions and public libraries	6
General public	4
Total	100

SOURCE: National Technical Information Service, 1988.

to direct electronic dissemination of documents and derived products (e.g., indices, abstracts, searches) are perceived by NTIS as meeting resistance from the information industry. The record of debate over NTIS privatization suggests a basis for this concern, although the views of industry are varied and complex. As a matter of practice, NTIS depends on the private sector for dissemination of online products (such as the NTIS Bibliographic Database available via DIALOG, BRS, and the like). NTIS estimates that private sector revenues derived from adding value to or re-marketing NTIS products totals about $11-12 million annually. NTIS reliance on the private sector for electronic and/or enhanced dissemination has had the perhaps unintended effect of discouraging NTIS from aggressively pursuing how electronic technology might improve even the NTIS core archival and clearinghouse functions. Improvements here could benefit both NTIS customers served directly by NTIS and those served indirectly via private sector vendors.

There is also an equity issue involved concerning access to the online NTIS Bibliographic Database and other online products. Some customers, and especially small businesses, independent researchers, and the general public, may not be able to afford the commercial rates (which can typically range from $50 per online hour and up). Since online searching of the NTIS database offers significant advantages, these customers could be disadvantaged in terms of their ability to effectively access and retrieve Federally funded scientific and technical reports.

In sum, NTIS presently operates in a constrained environment, characterized by ambivalent support from the government, limited financial resources (no public appropriation for the core clearinghouse and archival operations), mixed support from the information industry, limited technical resources, and a difficult product mix (many low volume items). In addition, the basic demand for NTIS products appears to be significantly eroding, thereby placing in considerable jeopardy the overall viability of NTIS as it is presently operating. At the same time, most NTIS users and client agencies believe in the NTIS concept and seek to find ways to strengthen NTIS or at least the core NTIS functions as a continuing element of the Federal Government.

The record of the NTIS privatization debate provides ample evidence of support for the NTIS concept. For example, in response to an April 1986 request for public comment,[1] NTIS received 138 written responses from executive agencies, the legislative branch, the information industry, and individuals or organizations that used NTIS.[2] Review of the responses, by NTIS[3] and OTA, indicates that:

- The NTIS user community overwhelming opposed privatization, supported NTIS as a government entity, and testified to the importance of scientific and technical information available from NTIS. The user community was heavily represented by library associations and individual university, public, and technical libraries.
- The Federal agencies which supply the source documents to NTIS opposed privatization, cited numerous problems that could or would result if NTIS were not a government entity, and emphasized their reliance on NTIS clearinghouse and archival functions.
- The information industry and individual company representatives overwhelming opposed privatization of the core NTIS functions on the grounds that these functions were not appropriate for the private sector and/or would create unfair competitive conditions. However, industry and company representatives strongly favored privatization of various dissemination and value-added functions.

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[1] U.S. Department of Commerce, "Study of Alternatives for Privatizing the National Technical Information Service", Notice and request for public comment, *Federal Register*, vol. 51, No. 81, Apr. 28, 1986, pp. 15868-15870.

[2] U.S. Department of Commerce, *NTIS Privatization Study Responses to April 28, 1986 Federal Register Notice Request for Public Comment*, PB86-211240, National Technical Information Service, Springfield, Virginia, June 1986.

[3] U.S. Department of Commerce, National Technical Information Service, "Analysis of Comments to Federal Register Notice", prepared by NTIS staff, 1986.

These general positions were reaffirmed at congressional hearings held in July 1987 and February 1988 by the House Committee on Science, Space, and Technology, Subcommittee on Science, Research, and Technology. At the latter hearing, the Subcommittee chairman released a letter from the Information Industry Association stating its position that "the Administration's proposal to privatize NTIS is not in the public interest in that it will ultimately reduce the availability of Federally funded scientific and technical information."[4]

Overall, the years-long debate over privatization of NTIS has further constrained the ability of NTIS to take initiatives, and has diverted substantial NTIS and Department of Commerce resources (primarily staff time and attention). Members of Congress and public witnesses have criticized the Administration for prolonging the debate when congressional sentiment against privatization is clear. In a February 23, 1988 letter, the Chairman and Ranking Minority Members of the House Committee on Science, Space, and Technology and Senate Committee on Commerce, Science, and Transportation wrote the Secretary of Commerce and requested delay in the privatization of NTIS activities until Congress completed legislative action.[5]

In a March 3, 1988 letter, the Chairman of the Subcommittee on Science, Research, Technology, and Space sought the views of the Secretary of Commerce on legislation to establish a National Technical Information Corp. The Chairman advised that "[i]t is clear to me that privatization of NTIS will not occur in the near future . . . To engage in a protracted NTIS privatization argument would be less than productive. I would much prefer to look beyond the privatization controversy to implementing everyone's underlying goal of transforming NTIS into a modern, low-cost deliverer of scientific and technical documents."[6] Congressional and agency officials, as well as public witnesses, have concluded that the drive for NTIS privatization was not based on a balanced analysis and finding of clear net benefits, and furthermore that the Administration did not have the capacity to successfully implement the NTIS privatization plans, even if thought to be desirable.[7] (For further discussion, see chs. 11 and 12 on policy issues and implications.)

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[4] Letter to Hon. Doug Walgren, Chairman, Subcommittee on Science, Research, and Technology, House Committee on Science, Space, and Technology, from Kenneth B. Allen, Senior Vice President, Information Industry Association, Feb. 12, 1988.

[5] Letter to Hon. C. William Verity, Secretary of Commerce, from Hon. Ernest F. Hollings, John C. Danforth, Robert A. Roe, and Manuel Lujan, Jr., U.S. Congress, Feb. 23, 1988.

[6] Letter to Hon. C. William Verity, Secretary of Commerce, from Hon. Doug Walgren, Chairman, Subcommittee on Science, Research, and Technology, House Committee on Science, Space, and Technology, Mar. 3, 1988.

[7] See U.S. Congress, House Committee on Science, Space, and Technology, Subcommittee on Science, Research, and Technology, *National Technical Information Service*, Hearing, 100th Congress, 2nd Session, U.S. Government Printing Office, Washington, D.C., Feb. 24, 1988. Also see A.S. Levine, "Legal Financial Woes Hamper NTIS Plan", *Federal Computer Week*, May 2, 1988, pp. 15-16.

OPPORTUNITIES AND CHALLENGES

The major challenge facing NTIS is defining a viable role for its future. A variety of indicators strongly suggest that the current role may not be sustainable absent some significant changes.

Trends in Demand and Revenues

The starting point for this analysis is the historical trend in demand for (and sales of) the major NTIS products and services. As shown in Table 5-3, NTIS appears to have had a healthy total revenue and cost performance in recent years, with net revenues realized in fiscal years 1981, 1983, 1984, 1986, and 1987, and net losses experienced in fiscal years 1982 and 1985. For the entire eight year period, NTIS realized net revenues of $4.6 million or about 2.8 percent of total sales.

Table 5-3.—NTIS Revenues and Costs, Fiscal Years 1980-87

Fiscal year	Total revenues $ millions	Total costs $ millions	Net revenues or loss $ millions	Net revenues or loss Percent
1980	18.6	17.8	0.8	4.3
1981	21.3	18.6	2.7	12.7
1982	19.4	19.8	(0.4)[a]	(2.1)
1983	21.4	20.4	1.0	4.7
1984	20.7	20.4	0.3	1.5
1985	21.3	22.1	(0.8)	(3.8)
1986	22.4	21.6	0.8	3.6
1987	22.3	22.1	0.2	0.9
Totals	167.4	162.8	4.6	2.8

[a] Parentheses indicate net loss.

SOURCE: National Technical Information Service, 1988.

However, a detailed analysis by major NTIS product line reveals a much different picture. Sales of all major NTIS products have declined markedly since 1980, in most cases by about 50 percent. For example, sales of paper copies dropped from 752,000 copies in fiscal year 1980 to 393,000 copies in fiscal year 1987. Sales of microfiche copies declined from 155,000 copies in fiscal year 1980 to 67,000 in fiscal year 1987. This pattern is repeated throughout the NTIS product line, as shown in Table 5-4.

Overall, sales of the above seven major NTIS products collectively declined from about 3.69 million units (copies or subscriptions) in fiscal year 1980 to about 1.82 million units in fiscal year 1987, a net decline of 51 percent. A review of all other NTIS products indicated that sales increased only for CUFT publications, data tapes, and data diskettes, but these items account for a small percentage of total NTIS sales. Trends in these three items and for software tapes and catalogs (which declined) are shown in Table 5-5.

An obvious question is how could NTIS maintain a breakeven operation with slightly increased revenues (in current dollars) over the fiscal year 1980-87 period, given the large reduction in product sales? Part of the answer is that NTIS per unit prices increased significantly over this same period of time, and with net price increases that typically equalled or exceeded the rate of inflation. For example, while paper copy sales decreased by about 50 percent, the average per unit price for paper copies increased by 70 percent over the 1980-87 period while inflation averaged 45 percent. Thus, in the case of paper copies, net revenues actually increased despite the drop in demand. This general pattern holds for all of the major NTIS products, as illustrated in Table 5-6.

In addition to maintaining revenues through increased prices despite declining demand, NTIS augmented sales revenues through:

- services to other agencies (such as order billing and processing),

Table 5-4.—Demand for Selected Major NTIS Products, Fiscal Years 1980-87

Product	Demand by fiscal year 1980	1981	1982	1983	1984	1985	1986	1987	Net change Number	Net change Percent
	(in thousands of copies)									
Paper copy demand	752	676	550	498	493	457	451	393	−359	−48
Microfiche copy demand	155	154	134	120	121	101	85	67	−88	−57
	(in millions of copies)									
Selected research in microfiche (SRIM)	2.72	2.74	2.48	2.37	2.34	1.94	1.78	1.33	−1.39	−51
	(in thousands of subscriptions)									
Government research announcements and index	2.22	2.01	1.85	1.61	1.49	1.38	1.25	1.15	−1.97	−48
Annual index	0.91	0.84	0.96	0.82	0.73	0.63	0.61	0.50	−0.41	−41
Abstract newsletters	16.0	14.0	12.5	12.2	11.0	10.4	8.6	6.8	−9.2	−58
Published searches	33.9	41.0	32.7	28.9	27.7	31.0	26.8	21.2	−12.7	−38

SOURCE: National Technical Information Service, 1988.

Table 5-5.—Demand for Selected Minor NTIS Products, Fiscal Years 1983-87

	Demand by fiscal year (number of copies)					Net change	
Product	1983	1984	1985	1986	1987	Number	Percent
CUFT publications	NA	4,227	5,412	6,577	5,552	+1,325	+31
Software tapes	524	586	537	638	380	−144	−28
Data tapes	1,405	1,783	2,174	2,493	2,503	+1,098	+78
Data diskettes	NA	NA	100	179	338	+238	+238
Software catalog	2,064	648	3,486	1,622	969	−1,095	−53

NOTE: NA = not available.

SOURCE: National Technical Information Service, 1988.

Table 5-6.—Average Per Unit Prices for Selected Major NTIS Products Compared to Inflation Rate, Fiscal Years 1980-87

	Fiscal year 1980 per unit price	Fiscal year 1987 per unit price	Net change		Inflation rate
Product			Dollars	Percent	
		Average price per copy			
Paper copies	$16.50	$27.87	$11.37	+69%	+45%
Microfiche copies	3.50	6.50	3.00	+86	+45
Selected research in microfiche	0.85	1.25	0.40	+47	+45
		Average price per subscription			
Government research announcements and index	$275	$379	$104	+38%	+45%
Annual index	375	479	104	+28	+45
Abstract newsletters	62	89	27	+44	+45
Published searches	30	45	15	+50	+45

SOURCE: National Technical Information Service, 1988.

- sales of computer-related products (which have a high average per unit price, about $67 per unit compared to $28 for paper and $6.50 for microfiche, as of fiscal year 1987), and
- NTIS brokerage fees on sales of other agency materials.

In fiscal year 1987 these three items together accounted for over a quarter of total NTIS revenues. The fiscal year 1986 and fiscal year 1987 revenue breakouts are shown in Table 5-7.

The comparison between fiscal year 1986 and fiscal year 1987 revenue data shows how NTIS has offset revenue decreases in full text reports and subscription, bibliographic, and announcement products with revenue increases in computer products and services to other agencies.

Whether and how long NTIS can be expected to remain viable operating on this basis requires examination. One risk is that continued reductions in the sales volume of reports, subscriptions, bibliographies, and the like could

Table 5-7.—NTIS Revenues by Product Group, Fiscal Years 1986-87
(In thousands of dollars)

	Fiscal year 1986		Fiscal year 1987		Net change	
Product group	Dollars	Percent	Dollars	Percent	Dollars	Percent
Full text reports	11,195	50.0	10,403	46.6	−792	−7.1
Subscription, bibliographic, and announcement products	6,100	27.3	5,429	24.3	−671	−11.0
Computer products	1,416	6.3	2,167	9.7	+751	+53.0
Services to other agencies	1,811	8.1	2,451	11.0	+640	+35.0
Patent licensing fees	617	2.8	575	2.6	−42	−6.8
Brokerage fees	1,095	4.9	1,220	5.5	+125	+11.4
Other	147	0.7	102	0.5	−45	−30.6
Totals	22,381	100.1	22,347	100.2		

SOURCE: National Technical Information Service, 1988.

necessitate further price increases, which could, in turn, further reduce sales, and so on. The elasticity of demand for NTIS products is not precisely known. NTIS staff believe that increasing price is one significant factor contributing to the decline in sales. For example, various library officials observe that rising NTIS prices have been a major factor contributing to reductions in NTIS subscriptions, especially as libraries are faced with increasingly tight budgets. This view is supported to some extent by results of the GAO survey of Federal agencies. Of the 114 civilian departmental components responding, 40 agency components evaluated the cost of NTIS reports in paper format and 27 evaluated the cost of microfiche format. Two-thirds of the agencies evaluated the costs for paper as high or very high, while two-thirds evaluated microfiche cost as moderate or low, as indicated in Table 5-8.

NTIS staff believe that online searching of the NTIS bibliographic database may also be contributing to a reduction in the number of requests for reports. The NTIS index products offered directly in paper or microfiche form and in electronic form via private sector vendors may well be improving the efficiency of customer searches of the NTIS archives, while at the same time may be undercutting sales of NTIS documents. The effects of online searching on overall NTIS demand are debatable. The experience with other online bibliographic databases has tended to be just the opposite; online searching has facilitated more awareness of and requests for the referenced documents. This subject warrants further research by NTIS and the library and information science community.

Other contributing factors include declining agency participation in the NTIS program and limited customer awareness of NTIS products. With respect to the former, NTIS reports that the number of new titles provided to NTIS by Federal agencies has declined by about 20 percent over the fiscal year 1983-87 period, as shown in Table 5-9. Assuming that NTIS was not receiving one-third of relevant agency materials in fiscal year 1983 (NTIS estimate), the fugitive document percentage would now be up to about 47 percent. In effect, this trend may compromise both the perceived and real utility of the NTIS archive. NTIS may now be receiving only about one-half of relevant agency documents.

This conclusion is qualitatively consistent with the results of the GAO survey of Federal agencies. Of the 72 civilian departmental agency components disseminating scientific and technical information, only one-half of the agencies responding use NTIS. Agencies appear to rely primarily on themselves for dissemination, secondarily on GPO, NTIS, and the Depository Library Program (DLP), and to an even lesser extent on the private sector. The results are presented in Table 5-10.

With respect to customer awareness of NTIS, NTIS has an ongoing series of activities to inform potential customers of NTIS services. However, the results of the GAO survey of

Table 5-8.—Federal Agency Evaluation of the Cost of NTIS Reports, Paper and Microfiche Formats, 114 Agency Components Responding

	Percent of agencies using NTIS	
Cost of NTIS report	Paper	Microfiche
Very high	22.5	7.4
High	45.0	22.2
Moderate	27.5	63.0
Low	2.5	7.4
Very low	2.5	—

SOURCE: GAO Survey of Federal Agencies, 1987.

Table 5-9.—Trend in New Titles Received by NTIS, Fiscal Years 1983-87

	Titles received		
Fiscal year	Number	Percent change	Estimated percent of all relevant agency titles[a]
1983	79,471		67.0
1984	71,587		60.4
1985	70,211		59.3
1986	69,760		58.9
1987	62,856		53.0
Net change (1983-87)	−16,615	−20.9	−14.0

[a] Assumes number of relevant agency titles remains constant at 119,000 per year.

SOURCE: National Technical Information Service and Office of Technology Assessment, 1988.

Table 5-10.—Federal Civilian Agency Dissemination of Scientific and Technical Information

Dissemination channel	Percent of agencies[a]
Own agency	93.1
Government Printing Office	52.7
National Technical Information Service	50.0
Depository libraries	50.0
Private sector vendors/contractors	36.1
Consumer Information Center	4.2

[a] Results expressed as percentage of agencies that disseminate STI that use each channel.

SOURCE: GAO Survey of Federal Agencies, 1987 and Office of Technology Assessment, 1988.

Table 5-11.—Scientific and Technical Association Use of Federal Information Sources, Rank Order

Source of Federal information[a]	Percent of associations responding that the source is used[b]
1. Trade, professional, or scientific journals	88.9
2. Newsletters	82.9
3. Newspapers	71.9
4. News magazines	68.9
5. *Individual Federal Agencies*	64.1
6. Radio/television	53.8
7. *Congressional agency* (LOC, GAO, OTA, CBO, CRS)	50.8
8. College/university library	45.8
9. *GPO mail/telephone orders*	44.4
10. *Office of U.S. Senator or Representative*	43.2
11. State or local government agency	42.6
12. Inhouse library or information center	39.5
13. Commercial bookstore	38.7
14. *Congressional committee*	37.7
15. Local public library	37.5
16. Commercial mail/telephone orders	35.8
17. *NTIS*	30.6
18. *Federal agency library*	25.2
19. Commercial online database vendor	24.8
20. *GPO bookstore*	23.7
21. *GPO depository library*	19.8
22. Commercial information brokers	15.4
23. *Consumer Information Center*	12.1
24. State agency library	11.2
25. State government library	7.8
26. Local school (Grades 1-12) library	1.7

[a] Federal sources are italicized.
[b] Agencies reporting that a source of Federal information is used occasionally, often, or very often.

SOURCE: GAO Survey of Federal Information Users, 1988.

Federal information users suggest that, overall, NTIS plays a rather limited role relative to other direct and indirect sources of Federal information. Among other groups, GAO surveyed a random sample of scientific and technical associations. Based on the responses of 133 associations (out of 250 sampled), NTIS is used by about one-third. Individual Federal agencies are used occasionally to very often, as are newspapers, news magazines, newsletters, and trade, professional, and scientific journals. Compared to other governmentwide information dissemination mechanisms, NTIS is used more often than the Consumer Information Center (CIC) or DLP, but less often then GPO mail/telephone orders. While associations are perhaps not the best indicator of NTIS customer awareness, science, environment, and technology were the most frequently cited categories of Federal information used by the respondents. The relative ranking of Federal information sources for these associations is shown in Table 5-11.

The relatively low use of NTIS may reflect a combination of low demand for NTIS products, low awareness of NTIS products, and/or, as mentioned earlier, high cost of NTIS products. In addition, OTA's independent consultant on university use of scientific and technical information concluded that NTIS is not viewed as a source of state-of-the-art information, due to the time delays between the existence of a document and its availability via NTIS. On the other hand, the role of NTIS as a secondary source of scientific and technical documents is appreciated, especially in the library community and among university researchers.[8]

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[8] Mark P. Haselkorn, Philip L. Bereano, Carolyn Plumb, and Patricia Tetlin, "Perspectives on Federal Dissemination of Scientific and Technical Information", OTA contractor report prepared by the Program in Scientific and Technical Communication, School of Engineering, University of Washington, Seattle, February 1988. Also see Charles R. McClure, Peter Hernon, and Gary R. Purcell, *Linking the U.S. National Technical Information Service With Academic and Public Libraries*, (Norwood, NJ: Ablex Publishing, 1986); and Peter Hernon and Charles R. McClure, *Federal Information Policies in the 1980s: Conflicts and Issues*, (Norwood, NJ, Ablex Publishing, 1987).

Possible New Initiatives

The nature of demand for NTIS documents makes NTIS highly suitable for application of electronic publishing and printing-on-demand systems. As noted earlier, the average demand for NTIS documents is 10 copies, and perhaps one-quarter of the documents never sell a single copy. As an illustration, for all documents archived by NTIS in calendar year 1986, there was no demand for 43 percent, only 5 percent sold more than 10 copies, and only 1 percent sold more than 50 copies. The detailed demand distribution is shown in Table 5-12.

In addition to very low total demand for most NTIS documents, demand for a given document can be spread over many years. For example, of the average sales of 10 copies per document, only 3 copies might be sold in the first year after announcement, 2 copies in the second year, 4 copies spread over the third through tenth years after announcement, and the last copy might be sold 11 to 15 years or more after being made available. This phenomenon is known as the demand decay curve, and is illustrated in Table 5-13 for NTIS documents sold during calender year 1986.

This highlights the NTIS dilemma: low sales volume spread over many years, but a document that sells only a single copy could contribute to significant innovations. While NTIS is able to identify documents that are relevant to current technical issues and research and development priorities, it is difficult to predict which documents will have high demand and virtually impossible to predict which documents will contribute to a major scientific or technical breakthrough. This is the primary rationale for the NTIS archive, and underpins the need to maintain NTIS documents on file indefinitely.

Table 5-12.—Demand for NTIS Documents Announced in Calendar Year 1986

Level of demand (total annual)	Number of documents (per demand level)	Percent of total documents announced
No demand	28,364	43
1 copy	10,906	17
2-5 copies	16,853	26
6-10	5,597	9
11-20	2,228	3
21-50	967	1
51+	379	1
Totals	65,294	100

SOURCE: National Technical Information Service, 1988.

Table 5-13.—Age of NTIS Documents Sold in Calender Year 1986

Date of document	Copies sold	Percent of total
1968 and prior	7,730	1.9
1969	1,412	0.3
1970	1,931	0.5
1971	2,489	0.6
1972	3,744	0.9
1973	4,346	1.1
1974	4,278	1.0
1975	4,942	1.2
1976	7,282	1.8
1977	8,117	2.0
1978	8,660	2.1
1979	9,571	2.3
1980	10,446	2.5
1981	14,799	3.6
1982	15,615	3.8
1983	24,318	5.9
1984	30,448	7.4
1985	72,149	17.6
1986	138,431	33.7
Pre-announcement demand[a]	2,854	0.7
Announcement date unknown[b]	37,423	9.1
Total	410,985	100.0

[a] Pre-announcement demand: Announcement date of 1987, orders were received in FY 1986 due to source pre-announcement, etc., and NTIS was able to fill the request.

[b] Announcement Date Unknown: Announcement date is not included in NTIS inventory file.

SOURCE: National Technical Information Service, 1988.

Fortunately, technological advances have created several possibilities that appear to be ideally suited to the nature of NTIS demand. First, most federally-sponsored or conducted scientific and technical reports are created on word processing or microcomputer-based systems. Thus, the keystrokes are captured electronically. The electronic versions of these reports are typically converted to paper (or microfiche) format by the originating agency (or the agency contractor) and submitted to NTIS as paper (or microfiche) copies. NTIS then disseminates copies in paper (or microfiche) in response to requests. About 80 percent of the NTIS reports are disseminated in paper format and the remaining 20 percent in microfiche. Because demand is low, and typically for one copy at a time, the per unit costs are high —averaging $25-30 per paper copy.

If NTIS could receive agency reports in electronic format, using compatible document description standards, then NTIS could apply electronic publishing and printing-on-demand technology where appropriate. For example, NTIS could develop and implement a version of the Electronic Document System similar to that being developed by DTIC. Documents could enter NTIS either in direct electronic format (by magnetic computer tape, floppy disk, or electronic transmission, similar to GPO receipt of publications material) or by scanning paper copies. DTIC envisions the use of high-speed, high-resolution optical scanning equipment that will compete favorably with the current microfiche system used by DTIC. However, direct electronic input should be less expensive than scanning for new input, at least for NTIS purposes. Scanning may, however, be the only option for converting old material. DTIC also envisions using high capacity, low cost per bit digital storage systems such as those using laser optical disks. High capacity WORM (Write Once, Read Manytimes) optical disk juke boxes should be applicable to both DTIC and NTIS. The 12-inch disks can store about one gigabyte of information per side, or roughly 400,000 to 500,000 pages of double-spaced typed material per side. This means that, assuming straight digitized text only and an average length of 200 double-spaced pages per document, the roughly 70,000 new documents received by NTIS each year could be stored on about 14 double-sided WORM optical disks.[9]

For output, DTIC plans to use high-speed, high resolution electronic printing equipment for producing paper documents on demand. Documents will be printed double-sided using plain bond paper to reduce paper and mailing costs. The reproduction cost should drop by an order of magnitude. The fully developed Electronic Document System permits the reproduction of full copies, and facilitates printing-on-demand of selected pages, since the text of documents stored on the system could be made available for electronic display at remote terminals. DTIC plans to use a standard structured database approach known as Standardized General Markup Language (SGML) to facilitate electronic document reproduction on a fast turnaround basis.

DTIC intends to continue its present microfiche-based production system in parallel with the Electronic Document System. However, as new documents are added in electronic format, the use of microfiche is expected to decline substantially. DTIC estimates that the electronic system will fill about 40 to 45 percent of paper copy requests after one year of operation, and about 60 to 70 percent of such requests after 3 years of operation. Should NTIS implement a similar system, NTIS could expect comparable results, with an estimated 35 percent of requests handled with electronic printing on demand after the first year, 60 percent of requests after 3 years, and perhaps 75 percent of requests after 5 years. These estimates assume that the NTIS backfiles (archival documents entered in earlier years) would be retained in microfiche, since demand is so low and the cost of conversion may not be justified.

Should NTIS implement its version of an Electronic Document System, NTIS would be positioned to offer search and retrieval capability, directly and/or via private vendors or other government agencies. Such software could build on the results, as they become available, of DTIC's Artificial Intelligence/Decision Support Laboratory. Another prototype is "Grateful Med," bibliographic search software developed by the National Library of Medicine for users of the MEDLARS database.

An NTIS Electronic Document System, if properly interfaced with the source agencies, should be able to substantially reduce the time lag between the existence of a document and its availability via NTIS. The time lag could be further reduced if interagency procedures are strengthened so that agencies are required to make more timely submissions to NTIS. Strengthening of such procedures could also address the question of how to increase the completeness of the NTIS archive. As noted earlier, perhaps one half of the scientific and technical reports generated by or for Federal agencies are not submitted to NTIS. While all the fugitive documents may not be relevant, it is likely that a significant portion of these are. Agencies could be required to provide more complete submissions and/or follow a specified set of procedures for determining what items should be submitted.

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[9] 70K documents x 200 pages per document = 14 million pages divided by 1 million pages per double-sided 12-inch WORM disk.

An electronic NTIS with a more complete and up-to-date archive would open up a wide range of possibilities for marketing and dissemination of scientific and technical information. The following illustrative activities could be implemented by NTIS, individual Federal science agencies, and/or private vendor:

- CD-ROM distribution of NTIS bibliographic database on selected subjects;
- CD-ROM distribution of NTIS documents on selected subjects;
- Floppy disk distribution of individual NTIS reports;
- Online distribution of selected NTIS documents with printing-on-demand of the entire document or selected pages at NTIS or remote locations;
- Electronic bulletin board announcement of selected new NTIS documents of general interest; and
- Electronic bulletin board announcement of NTIS documents on subject matter matched to the bulletin board participants.

In essence, an electronic NTIS would have the capability to produce multi-format output —paper, microfiche, offline electronic, or online electronic as appropriate, depending on the type of product and user needs. As noted earlier, the GAO survey results highlighted the significant anticipated increase over the next three years in demand for scientific and technical information in electronic formats on the part of libraries and scientific and technical associations. Demand for paper and microfiche is anticipated to decrease moderately over the next three years.

Overall, an electronic NTIS should be able to greatly increase the diversity and timeliness of NTIS (and related private vendor) offerings, increase the ability of NTIS (and private vendors) to match information products with potential users, and reduce the cost of NTIS (and private vendor) products. An electronic NTIS also should be better able to serve, especially, small and medium businesses and individual researchers who tend to be penalized by the present paper-based system that assigns a premium to economies of scale. Understandably, NTIS directs much of its marketing efforts at its largest customers who generate the most sales, but who also are typically well staffed with information specialists. An electronic NTIS would increase the incentives and available options to reach smaller market segments from whence many innovations ultimately originate. It is certainly conceivable that NTIS could eventually be used by the individual researcher and entrepreneur who depend heavily on informal and collegial networks for the sharing of scientific and technical information. Also, NTIS would be a logical key participant in the development of a governmentwide information index, for which respondents to the GAO survey of Federal information users indicated strong interest. Such an index would also help improve the ability of researchers and entrepreneurs to know of potentially relevant information. Finally, as a complement to the electronic document system and improved indexing, increased agency participation in the NTIS clearinghouse may need to be mandated. The declining trend in the percentage of agency scientific and technical documents submitted is cause for concern. While including 100 percent of agency documents in NTIS is unrealistic, some steps could be taken to broaden the coverage and increase the timeliness of agency submissions. This could be accomplished through interagency agreements, OMB circulars, and/or, if necessary, legislation.

NTIS/SUPDOCS COOPERATION

The consolidation of NTIS with GPO's SupDocs has been proposed by the Public Printer and as part of legislation introduced in the past two Congresses that would establish a Government Information Office. However, this section focuses on opportunities for improved cooperation between NTIS and SupDocs, irrespective of the formal institutional structure, since the need for improvements in NTIS/SupDocs marketing, product line analyses, and coordination will exist regardless of the institutional structure. (See chs. 11 and 12 for further discussion of institutional alternatives.)

The major reasons advanced for improved NTIS/SupDocs cooperation (whether or not through formal consolidation) are: efficiencies in management and operations, improved coordination of Federal information dissemination, enhanced opportunities for use of new technology, strengthened joint marketing programs, reduced overlap and duplication in government dissemination activities, and improved overall public access to Federal information. Possible drawbacks of or barriers to improved cooperation include: some differences in current missions of the NTIS and SupDocs and resultant potential problems in more closely coordinating these functions, difficulties inherent in cooperative activities of agencies from different branches of government, and reluctance on the part of some Federal agencies to cooperate with NTIS and/or SupDocs, regardless of the institutional structure.

Differences and Similarities

The major differences between NTIS and SupDocs are that:

- NTIS is in the executive branch while SupDocs is in the legislative branch;
- NTIS maintains a permanent archive of scientific and technical documents totalling close to 2 million items, while GPO maintains documents in inventory only while in stock or if reprinted (usually due to strong demand);
- NTIS has 2 million document titles for sale whereas the average SupDocs sales inventory is about 20,000 or about one percent of the NTIS inventory;
- the average NTIS sales volume is about 10 copies per title whereas the SupDocs average is on the order of 2,000 copies per title;
- NTIS retains all titles received in the NTIS archive and available for sale, while SupDocs for the most part includes only the titles judged to have significant sales potential;
- the NTIS annual sales volume is in the few millions range whereas the SupDocs volume is in the few tens of millions range; and,
- NTIS is considerably smaller than SupDocs—at year end fiscal year 1987, NTIS had 344 employees compared to 930 for SupDocs, NTIS had total revenues of about $22 million in fiscal year 1987 compared to about $100 million for SupDocs (figures include reimbursed services and services funded through appropriations).

At first glance, these differences could appear as, collectively, a significant barrier to improved cooperation. However these differences could become complementary aspects of a combined strategy for institutional survival and growth.

There are significant similarities between NTIS and SupDocs:

- Both must operate their sales programs on a breakeven basis, that is, there are no appropriations to subsidize the cost of sales.
- Both must compete with private vendors, who can always reprint and resell government documents since these materials cannot be copyrighted.
- Both must compete to some extent with

Federal mission agencies, who frequently distribute significant numbers of copies of documents free of charge to agency clients, contractors, and interest groups.

Both NTIS and SupDocs carry out marketing activities in support of their sales programs, although the programs have relative strengths and weaknesses:

- NTIS produces a variety of specialized subject matter searches that have no direct parallel at SupDocs.
- SupDocs makes growing use of radio and television public service announcements and is revitalizing the GPO bookstores as sales outlets, marketing tools not used by NTIS.

NTIS and SupDocs perform reimbursable services for other agencies:

- In fiscal year 1987, NTIS performed about $2.5 million worth of services for other agencies (accounting for roughly 10 percent of total revenues).
- In fiscal year 1987, SupDocs performed about $5 million in reimbursable services, primarily for operating the CIC for GSA (accounting for about 5 percent of total SupDocs revenues).
- If the DLP, also operated by SupDocs, is counted as a reimbursable service funded through appropriations, then reimbursable services would be about 25 percent of total SupDocs revenues.

The similarities go on. Both NTIS and SupDocs prepare indices or catalogs to government documents. NTIS publishes a weekly and annual *Government Reports Announcement and Index Journal* (known as GRA&I) that includes summaries of government conducted or sponsored research reports. The summaries are indexed by subject, author, institution, and contract number (if applicable). NTIS also prepares the NTIS Bibliographic Database that includes all items in the NTIS archive. In addition to government conducted or sponsored reports, the NTIS Database includes federally-generated machine readable data files and software, U.S. Government inventions available for licensing, and foreign government reports exchanged with Federal agencies and any federally-generated translations thereof. The NTIS database is updated biweekly and, is available online through commercial vendors.

SupDocs prepares:

- the *Monthly Catalog of United States Government Publications* (which indexes publications by author, title, subject, series/report number, contract number, stock number, and title keyword);
- the 3 times a year *Consumer Information Catalog* (which lists consumer publications from about 30 Federal agencies that are available free or at minimal charge from CIC);
- the quarterly *Government Periodicals and Subscription Services* (which lists over 500 subscriptions to periodicals and recurring reports published by more than 40 Federal agencies and sold by SupDocs);
- the 3 times a year *U.S. Government Books* (which catalogs about 1,000 of SupDocs best-selling publications); and
- the bimonthly *New Books* (which lists new SupDocs sales items).

Information on SupDocs sales items, bibliographies, and catalogs is available from private vendors, in both online and CD-ROM formats. For example, the GPO Sales Publications Reference File, which lists all GPO titles currently for sale, is available online to the public via the commercial DIALOG information retrieval service and includes an online ordering capability.

Both NTIS and SupDocs primarily use paper and microfiche formats for dissemination, although NTIS sales of computer tapes, floppy disks, and software have been growing, as have GPO sales of computer tapes. Both NTIS and SupDocs have international exchange programs to encourage the two-way flow of information between the U.S. and other countries. Finally, it bears emphasis that, except for the type of bibliographic and index products mentioned earlier, both NTIS and SupDocs depend on the Federal mission agencies as the primary source of documents. The agencies (including Congress for SupDocs purposes) create the documents and in many cases handle primary distribution; NTIS and SupDocs as governmentwide information dissemination mechanisms are responsible for, in effect, secondary distribution through their sales programs (and through the DLP and CIC in the case of SupDocs). Private vendors also serve as secondary distributors of selected agency documents.

Disadvantages and Advantages

The possible disadvantages of improved NTIS/SupDocs cooperation are erosion of the NTIS archive function and aggravation of separation of powers concerns. Representatives of the scientific and technical community as well as the Federal science agencies believe that the NTIS archive or something equivalent is essential to the U.S. research and development effort and to basic science and technical innovation. From this perspective, cooperative initiatives would have to be designed so as to ensure continuity of the archive. If the DLP is viewed as part of SupDocs, then SupDocs does already have an archive function, since the regional depository libraries maintain a complete archive of all government publications distributed to them, 60 percent of which in recent years are in microfiche format. Also, either microfiche masters or camera ready copy existed at some previous point in time for most of these materials. However, retention of these originals is incomplete, and neither the originals nor the regional depository library archives are available as part of a coordinated sales program. The SupDoc's Library Programs Service does maintain a collection of microfiche masters procured for the DLP, and plans to eventually transfer this collection to the National Archives and Records Administration (NARA). Copies of some of these items are available for sale on demand. It also should be noted that NTIS has submitted to NARA a plan that provides for transferring NTIS master microforms to NARA when records are 10 years old.

The actual current overlap between the NTIS archive and the SupDocs sales program is thought to be small; the overlap between the NTIS archive and the regional library archives is unknown (as the libraries do receive some NTIS publications).

Another possible disadvantage is aggravation of separation of powers concerns, since NTIS is in the executive branch and SupDocs in the legislative. Some Federal executive branch agencies do not like the current roles of GPO and the Joint Committee on Printing (JCP) (as authorized by Title 44 of the U.S. Code) with respect to agency printing and publishing activities, view those roles as inappropriate and/or unconstitutional (see ch. 11), and oppose any greater role for them. Regardless of the merits or demerits of these concerns, the role of SupDocs has not been the primary focus of attention or challenge. In fact, some NTIS officials believe that NTIS is handicapped because, while Federal agencies are required to participate in the SupDocs sales program, agency participation in the NTIS archive is voluntary and not required by statute. SupDocs seems to be able to work effectively with many executive branch agencies, even though SupDocs is in the legislative branch. Nonetheless, improved NTIS/SupDocs cooperation and especially a consolidation is viewed by some Commerce Department and OMB officials as possibly aggravating conflicts over separation of powers, but more importantly, from their perspective, further distancing the creators of the information (the executive agencies) from the disseminators. In this view, the decentralizing tendencies of electronic technologies should be encouraged by placing information dissemination as close as possible to the ultimate users of the information. The strengthening of centralized dissemination mechanisms (whether SupDocs, NTIS, or even governmentwide indices) seems to be feared and resisted, even if centralized dissemination would not preempt agency dissemination.

It seems plausible that strengthened NTIS-SupDocs cooperation would lead to improvements in indexing, marketing, and international exchange. Perhaps most important, however, is the potential improvement in overall strategic posture that could result from improved cooperation. As presented earlier in detail, NTIS is in a very vulnerable situation. In contrast, SupDocs has maintained better than breakeven operations in recent years, with net income of $11.4 million in fiscal year 1987 and $5.5 million in fiscal year 1986. However, while in a strong position compared to NTIS, SupDocs has some emerging areas of vulnerability that could become significant in a rather short period of time.

Like NTIS, SupDocs could be vulnerable to electronic competition. For example, one of SupDocs largest revenue sources is the *Commerce Business Daily (CBD)*, with subscriptions generating more than $9 million in SupDocs revenue, or about 12 percent of total sales revenue in fiscal year 1987. However, the results of private sector marketing of the *CBD* online or on CD-ROM suggests that electronic formats may be preferable for many *CBD* customers. If the demand for paper copies declined dramatically over the next few years, it is conceivable that the Department of Commerce might stop funding the set-up charges for printing paper copies. While SupDocs presumably could continue to print the *CBD* itself, the cost would increase significantly, since SupDocs now pays only the marginal printing cost, but would have to pay the full printing cost if the Department of Commerce ceased participation. This could put SupDocs in the position of raising prices for paper copies of a product (the *CBD*) that clearly is well suited to electronic formats, especially online. If the NTIS experience is any guide, higher prices could further reduce sales and encourage more users to switch to electronic formats, which in turn could lead to yet another price increase for paper copies to cover fixed costs with a smaller sales volume. According to GPO, under current law, if the Department of Commerce stopped printing the *CBD*, there would be no printing requisition for SupDocs to "ride" (order extra copies) and thus no "additional copies" for SupDocs to sell.

Other SupDocs best sellers that might be vulnerable include (with fiscal year 1987 revenues indicated): the *Code of Federal Regulations* ($2 million), *Federal Acquisition Regulations* ($1.9 million), *Tariff Schedules Annotated* ($0.9 million), and *DoD FAR Supplement* ($0.9 million).

At the moment, SupDocs sales volume and total distribution appear to be holding reasonably steady. Most indicators declined in the early 1980s, but have since been relatively level. Trends for fiscal years 1981-87 are shown in Table 5-14 for SupDocs sales orders, copies sold, CIC free orders, CIC copies distributed, and depository library copies distributed.

A detailed analysis of the SupDocs product line is warranted to determine if significant vulnerability extends beyond items such as the *CBD* and, as discussed in chapter 4, the *Record* and *Register*, that are well suited to electronic formats. Overall, SupDocs would appear to be in a stronger position than NTIS, since many of the traditional government reports and periodicals sold or distributed by SupDocs are likely to be best suited to paper formats for years to come. Also, SupDocs has potential opportunities in other areas, such as sales of government forms. For example, in fiscal

Table 5-14.—SupDocs Sales and Distribution Activity, Fiscal Years 1981-87

	Millions of orders or copies						
	Fiscal year 1981	Fiscal year 1982	Fiscal year 1983	Fiscal year 1984	Fiscal year 1985	Fiscal year 1986	Fiscal year 1987[a]
Sales orders[b]	2.0	1.5	1.3	1.5	1.5	1.5	1.6
Free CIC orders	3.9	2.4	2.3	2.2	2.1	2.6	2.2
Copies sold[b]	29.8	25.9	24.5	24.8	26.7	27.1	26.7
Free CIC copies distributed	NA	25.7	23.0	14.7	21.9	19.2	21.5
Depository library copies distributed	28.7	20.7	31.9	37.1	36.1	26.7	22.7

[a] Estimates.
[b] Includes CIC sales.

SOURCE: U.S. Government Printing Office, 1988.

year 1987, SupDocs sold IRS forms to tax practitioners. About 80,000 orders were processed, yielding a gross revenue of $2.8 million and net revenue of $1.5 million. Nonetheless, given the strong commitment of many Federal agencies to shift to electronic formats over the next few years, especially for statistical, scientific and technical, and administrative documents, the SupDocs sales and distribution outlook bears continuous scrutiny.

NTIS-SupDocs cooperation could be especially synergistic with regard to low-demand items. At present, the NTIS product sales line is dominated by low demand documents, but NTIS does not have the resources or mechanism to invest in the electronic technology best suited to low demand dissemination. On the other hand, the SupDocs product sales line is almost devoid of low demand items, yet SupDocs does have access to the GPO revolving fund for capital investment in electronic technology (subject, of course, to approval of the Public Printer and JCP and to overall GPO funding constraints). An NTIS-SupDocs cooperative initiative could design an Electronic Document System (similar to the DTIC prototype) that would meet NTIS needs plus a broadening of the SupDocs product line to include selected low demand items.

The economics of electronic printing-on-demand for low volume documents are quite simple. Many of the cost elements in conventional printing are essentially fixed, and are not affected by the number of copies printed, as shown in Table 5-15.

Thus most costs are independent of the size of the press run, and reducing the length of the press run increases the per unit printing cost, all other things being equal. Electronic printing eliminates most of the prepress functions, although the cost of toner (e.g., for laser printers) is higher per page than the cost of printing ink. Electronic printing is generally less expensive per page at volumes of tens to a few hundred. In addition, electronic printing facilitates electronic linkages between the document database and user terminals for online searching and printing-on-demand of selected pages.

Table 5-15.—Conventional Printing Functions Affected by Length of Press Run

Function	Affected by length of press run
Composition	No
Camera	No
Platemaking	No
Film	No
Plates	No
Press makeready	No
Press running	Yes
Bindery set-up	No
Bindery running	Yes
Paper	Yes
Ink	Yes

SOURCE: F.J. Romano, 1988.

Electronic printing provides cost-effective multiformat output capability and is especially suited to low-volume, shorter, and simpler documents with straight text or text and tables and a minimum of photographs and complex line art (high-end systems can handle photos and art work, although at higher cost). Best estimates suggest that over half of the documents printed by GPO, and about 90 percent of the documents printed by other agencies, are 100 pages in length or less. Estimates also indicate that about 90 percent of all material is straight text (80 percent) and tables (10 percent). The detailed breakout is shown in Table 5-16.

Table 5-16.—Estimated Page Length and Content of Government Documents

	GPO	Other Government	Overall average
Page length			
10 pages or less	9%	13%	11%
11-50 pages	23	30	26
51-100 pages	25	37	31
101-250 pages	20	10	15
251-499 pages	15	5	10
500 pages or more	8	5	7
Page content			
Text			79.3%
Tables			11.8
Line art			4.8
Photographs			4.1

SOURCE: GPO and F.J. Romano, 1988.

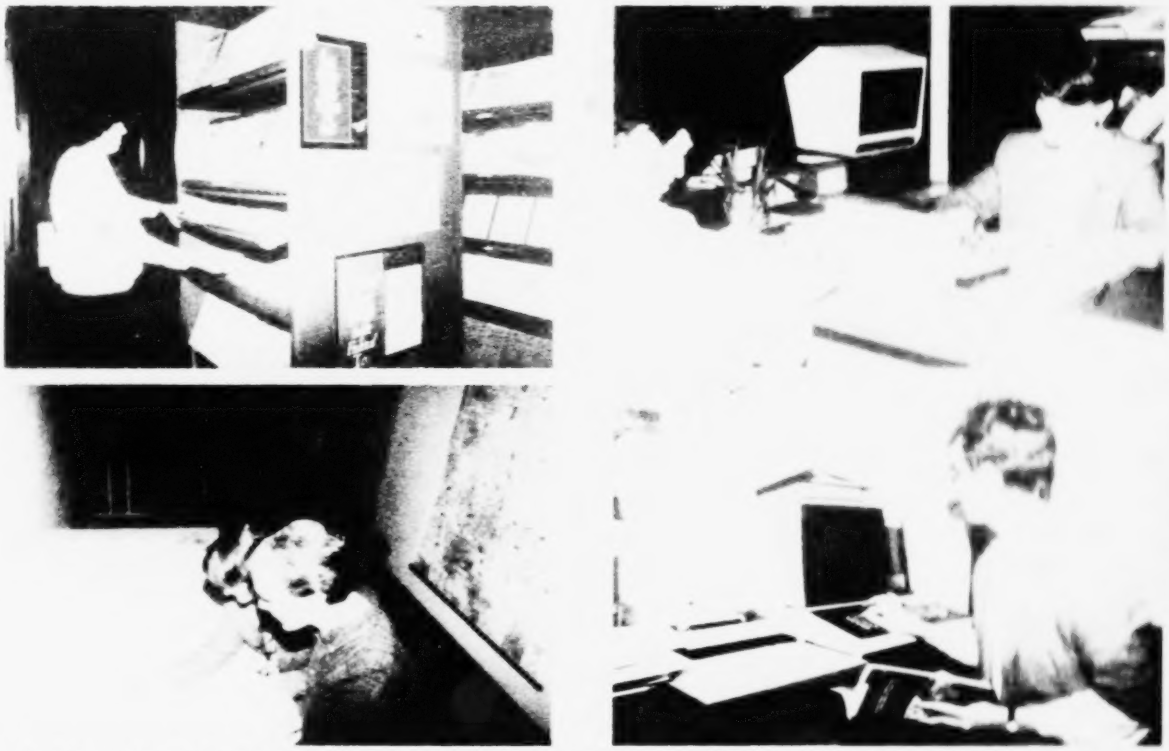
In sum, many government documents are suitable for electronic printing if the demand is low. Clearly many NTIS document sales items meet this criterion. At present, few SupDocs sales items meet this criterion, since average sales volume is about 2,000 copies (and the average GPO press run is 3,000 to 4,000 copies). However, a significant number of government documents not presently included in the GPO sales program may be viable on an electronic printing-on-demand basis. The combined NTIS and SupDocs low-demand sales volume could help justify investment in the necessary equipment. An Electronic Document System could be funded out of the GPO revolving fund and charged back to SupDocs as depreciation, just like any other SupDocs capital investment. NTIS could reimburse SupDocs for a prorated portion of the capital investment, funded out of NTIS retained earnings (if authorized by Congress).

NTIS-SupDocs cooperation could also be synergistic with respect to sales of what NTIS calls computer products. As noted earlier, this has become a significant product line for NTIS, one of the few showing recent sales growth. However, it is likely that only a small fraction of agency computer products are included at the present time. SupDocs has initiated a related sales program that at present is limited to a few magnetic tapes. An expanded SupDocs program could start to duplicate NTIS. A single coordinated governmentwide sales mechanism presumably would be more efficient and easier for both the participating agencies and the customers. Many agencies would still be likely to distribute some computer products themselves. A coordinated and possibly even consolidated NTIS-SupDocs computer product line could also benefit from appropriate use of GPO bookstores, catalogs, and advertising, and would fit well with the concept of a governmentwide index to Federal information in all formats.

Another potential advantage of NTIS-SupDocs cooperation would be to improve coordination among all four of the governmentwide information dissemination mechanisms (SupDocs, NTIS, DLP, and CIC) and help insure that statutory requirements are fulfilled. It is also possible that improved cooperation would result in reduced total overhead and indirect labor, due to efficiencies in certain management and administrative functions. However, a full analysis would require more detailed information on NTIS and SupDocs cost and labor force structures.

Chapter 6

Information Technologies, Libraries, and the Federal Depository Library Program



Clockwise from top left: library shelving with document collection materials; librarian assisting user at reference desk; librarian assisting user with map collection; and user on an OCLC terminal (photo credits: Documents Center, Robert W. Woodruff Library, Emory University)

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Chapter 6

Information Technologies, Libraries, and the Federal Depository Library Program

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SUMMARY

Chapters 6 and 7 explore the role of libraries, and particularly those participating in the U.S. Government Printing Office (GPO) depository library program (DLP), in the dissemination of Federal information to the public.[1] The program is a cooperative activity between the Federal Government and approximately 1,400 libraries. The government provides copies of government-produced materials free of charge to the libraries; the libraries, in return, provide housing for the documents and access to this information free of charge to their patrons. DLP is a principal avenue of access to government information for the public. It is recognized as one of several guaranteed channels of public access to government information established by Congress in support of our democratic form of government, and serves in part as an "information safety net" for members of the public. This safety net is changing because of the increasing use of information technologies by Federal agencies in support of agency programs. This use is influencing the way in which agencies conduct their business, and how citizens access government information.

This chapter examines how libraries employ a variety of information technologies to support their mission of "allowing people to utilize information."[2] First, the chapter reviews the role of libraries in the dissemination of government information in the United States. This is followed by a discussion of key technological trends and applications relevant to libraries in general and to depository libraries in particular. The technologies examined include microcomputers, online databases, library communication networks, electronic bulletin boards, facsimile, and optical disks. Next, the history of the depository program is briefly reviewed, followed by a description of current dissemination efforts in the Library Programs Service. Three topics concerning access to government information are examined in detail:

- dual format which concerns the distribution of selected materials in paper and microfiche;
- provision of government information in electronic formats to depository libraries through a pilot project program; and
- the development of online catalogs in depository institutions.

The three topics are concerned with meeting the information and format needs of users, while at the same time facing and resolving new financial issues.

OTA has found that depository libraries are increasingly incorporating new technologies in support of user services and operations. The results of the General Accounting Office Survey of Federal Information Users, when compared to earlier depository library data, indicate a strong and growing technology base in depository institutions. For example, 83 percent of those surveyed have access to microcomputers with modems for online access, 95 percent have access to microfiche readers with printers, 41 percent have access to a CD-ROM reader, and 36 percent have access to a mainframe computer facility. The survey also found that these same institutions intend or wish to expand their use of information technologies within the next 3 years to support user information needs. OTA has concluded that information technologies, if appropriately planned and executed, hold the promise of helping to achieve the original goals

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[1] In this report, use of the phrase "depository program" refers only to the GPO depository library program.

[2] M. Turoff and M. Spector, "Libraries and the Implications of Computer Technology," proceedings of the *AFIPS National Computer Conference*, vol. 45, 1976.

and intent of the depository program through enhanced access to government information.

Information technologies are changing how libraries function and how users seek information. Many libraries are deploying the electronic technologies to become gateways to information with the use of local, State, regional, and national networks and information services—both public and private. The relatively recent, rapid introduction of new information applications, such as full-text online retrieval of networked information services and CD-ROM tools, demonstrates that librarians and information providers are experimenting with current electronic capabilities and future opportunities in order to meet user information needs. For example, it appears that since government information has been integrated into library collections through online catalogs, use of the information has increased significantly.

While these technologies present the user with different types and levels of access, they also present both the librarian and user with new cost concerns and format decisions.

INTRODUCTION

People need information to perform a variety of daily tasks, to participate in governmental deliberations, to vote, to be effective members of a community, to make business decisions, and more. As the largest collector and disseminator of information in the United States, the Federal Government is responsible for creating and disseminating much of this "information" used by the public. Information reaches the public through a number of formal and informal, complimentary and competitive channels. These range from agency programs with specific dissemination charters to private sector services, and from public interest group efforts and the media to libraries—State and local public libraries, libraries in academic and research institutions, special libraries, and Federal libraries.

Many of these channels are supported by the Federal Government in recognition of the importance of public access to government information. This is a basic tenet of U.S. society and is considered vital to the functioning of our democratic form of government. As stated by Jefferson:

> If a nation expects to be ignorant and free in a state of civilization, it expects what never was and never will be . . . if we are to guard against ignorance and remain free, it is the responsibility of every American to be informed.[3]

Recognition of the importance of an informed citizenry has been affirmed since the founding of the country, and continues through the enactment of new laws such as the Freedom of Information Act, Government in the Sunshine Act, and the law establishing the DLP. As stated by Senator Lausche during hearings on the Depository Program in 1962:

> Although it may sound trite, an intelligent, informed, populace has been, is and will continue to be the fundamental element in the strength of our Nation. Contributing greatly to that intellectual strength is the so-called Government document, designed to disseminate to the American public important information relative to the activities and purposes of its Government.[4]

There is also the understanding that: "equally important is their (the people's) ability to access all other types of information, information that has a direct bearing on the quality of life our citizens enjoy."[5]

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[3] Letter to Col. Charles Yancey from Thomas Jefferson, July 6, 1816.

[4] U.S. Congress, Committee on Rules and Administration, Subcommittee on the Library, *Depository Libraries, Hearings on S.2029 and H.R. 8141 To Revise the Laws Relating to Depository Libraries*, 87th Cong., 2d session, Mar. 15-16, 1962, p. 25.

In addition to democratic and quality of life principles, the DLP serves the business community, which is important to local, State, and national economies. Congress, through the establishment of the DLP, specifically recognized the need for a guaranteed channel of access to government information by citizens, and in Title 44 describes the purpose of the program as an avenue of dissemination of government information free of charge to the public:

> The depository library system is a long-established cooperative program between the Federal Government and designated major libraries throughout the United States under which certain classes of Government publications are supplied free of cost to those libraries for the purpose of making such publications more readily accessible to the American public.[6]

The primary mission of the program as set out in the 1977 *Guidelines For the Depository Library System* is: ". . . to make U.S. Government publications easily accessible to the general public and to insure their continued availability in the near future." The *Guidelines* also note that the materials will be forwarded to the participating institutions "without delay," again to insure timely access to information by citizens.[7] There are two other elements of program mission: use of government documents by the academic/research community; and educational needs and use.

The Office of Management and Budget (OMB) also recognized the importance of the program in Circular A-130 and noted that: "depository libraries provide a kind of information 'safety net' to the public, an existing institutional mechanism that guarantees a minimum level of availability of government information to all members of the public," and "the Federal Government shall rely upon the depository library system to provide free citizen access to public information."[8]

There are many classes of government information collected for a variety of purposes, and these are disseminated to the public through the DLP. Some information is referred to as process, core, or basic information such as that found in the *Federal Register* and *Congressional Record*, executive and congressional budgetary information, and the like. This information is recognized as both a product of the operation of government and a necessary element to maintaining an educated and informed citizenry. As noted by members of the Subcommittee on the Library, "Government publications generally serve two main purposes. In the first place they have a functional value in the agency which issues them. Secondly, and often quite as important, they have an educational value which makes their availability to the American public a highly desirable objective."[9] In the course of fulfilling their missions, agencies collect information. Some agencies, such as the Bureau of Census, collect information on the population as their mission; other agencies, such as the Department of Transportation, collect information in order to effect policy and regulation. This same information is then used by a variety of communities—business and industry, academia, and others—for a variety of purposes.

The Federal Government has long recognized the importance of libraries as a channel for disseminating information it has collected. The role of libraries in society, and the unique role of libraries in support of the "public good," have been well defined.[10] Libraries perform a number of tasks in our society—"conserving and preserving our cultural heritage,"[11] providing educational resources to various publics, and disseminating government information. "The library . . . collects all the knowledge of society, all the information, unedited, unscreened, unrewritten, and instead of broadcasting it to the masses, organizes, and directs that information to the individual."[12] As noted by Curley, "Libraries do not serve merely individual, informational, and recreational interests, but are part of the essential fabric of our society—its fragile cultural and social ecology."[13] **Libraries and librarians promote access to all types of information and represent user interests and information needs. A library collection, regardless of format, reflects the information needs of its users, whether they be the local community, academic, research, special interest institution, State, or region.**

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[5] Testimony of Joseph Duncan on behalf of the IIA in U.S. Congress, Committee on Government Operations. *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview*, 99th Cong., 2d sess., House Report No. 323, 1986, p. 52.

[6] U.S. Congress, Senate Committee on Rules and Administration, op. cit., footnote 4, p.1.

[7] Depository Library Council, *Guidelines for the Depository Library System* GPO: (Washington, DC: Oct. 18, 1977), p. 1.

[8] Office of Management and Budget, "Management of Federal Information Resources", Circular No. A-130, Dec. 12, 1985, and "Improved Management and Dissemination of Federal Information: Request for Comment," *Federal Register*, vol. 45, June 9, 1980, p. 38462.

[9] U.S. Congress Committee on Rules and Administration, Senate Report No. 1587, 87th Cong., 2d sess., 1962 p. 8.

Today , there are over 8,000 public libraries, 3,000 college and university libraries, 88,000 elementary and secondary school libraries, 2,700 Federal libraries, and 11,000 private and other special libraries in the United States.

This number and diversity are due in large part to Federal Government reconition of the importance of access to information through libraries. Since the founding of the Nation, there has been government support of libraries. The Continental Congress arranged with the Library Company of Philadelphia to receive needed information for its members, and the First Congress of the United States arranged access to the New York Society Library for similar purposes. In April 1800, the Library of Congress (LOC) was established and is now the largest library in the world. It continues to be the principal library for Congress. In the late 1850s the DLP was established to make congressional and other governmental information more broadly available to the general public. The establishment of a depository library system was further affirmation by Congress of the need for a sound distribution system for government documents through libraries.

In addition, two national libraries were established—the National Library of Medicine (NLM) began in 1836; and the National Agricultural Library (NAL) was created in 1862 with the establishment of the U.S. Department of Agriculture. A variety of other information dissemination mechanisms were subsequently created, expanding the number of avenues for citizens to receive government information—the National Archives in 1943, now known as the National Archives and Record Administration (NARA); the Federal Library Committee in 1965, now known as the Federal Library and Information Center Committee (a cooperative organization of Federal libraries); the National Technical Information Service (NTIS) in 1970 (its predecessor, the Office of Technical Services, was created in 1946); and other Federal depository programs such as the Patent Depository Library Program. In addition, a series of congressional actions led to increased Federal involvement in libraries and, expanded the role of libraries in the provision of information to citizens.

Since the Library Services Act (LSA) was passed in 1956, the relationship between the Federal Government and libraries has expanded markedly. Libraries are one means by which the Federal Government seeks to provide educational resources, services, and opportunities to both a broad populous and to specific segments of society. LSA provided library services to rural areas, and the Higher Education Act of 1957 authorized funds for the purchase of books, periodicals, and other library materials; library training programs; and R&D for new ways to program, process, store, and disseminate information. The Library Services and Construction Act (LSCA) provides services to rural areas and allows funding for facilities' construction, enhancing of interlibrary cooperation, and increased service for physcially handicapped, disadvantaged, and bilingual individuals.[14] LSA, the Higher Education Act, and LSCA have enhanced the libraries' ability to serve the general population, and with various government information dissemination programs, serve to strengthen and reinforce the role of libraries in the dissemination of government information. As noted in congressional hearings on the depository library program:

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[10] Public good is the concept that the "good" for society is greater than the well-being of certain individuals within it; see *Libraries, Coalitions and the Public Good*, E.J. Josey, ed., (New York, NY: Neal-Schuman Publishers, Inc., 1987).

[11] Robert Wedgeworth, "A Library Agenda for the 1980's," in *An Information Agenda for the 1980's*, Carlton C. Rochell, ed., Proceedings of a Colloquium, (Chicago: American Library Association, June 17-18, 1980), p. 94.

[12] John N. Berry III, "The Public Good: What Is It?" *Libraries, Coalitions and the Public Good*, E.J. Josey, ed., (New York, NY: Neal-Schuman Publishers, Inc. 1987), p. 10.

[13] Arthur Curley, "Towards a Broader Definition of the Public Good," *Libraries, Coalitions, and the Public Good*, E.J. Josey, ed., (New York, NY: Neal-Schuman Publishers, Inc. 1987), p. 36.

> The Government is able to make such information available to the citizenry due in large measure to the splendid cooperation of the American library profession. This is a service to the Nation which its libraries have performed in the past, are presently performing, and are anxious to perform in the future to a greater degree and in a more comprehensive manner.[15]

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[14] U.S. Congress, House Committee on Education and Labor, Subcommittee on Postsecondary Education, *Hearing on Libraries*, testimony of E.J. Josey, 99th Cong., 2d sess., Apr. 8, 1986, pp. 11-14.

[15] U.S. Congress, Committee on Rules and Administration, op. cit., footnote 4, p. 26.

ROLE OF INFORMATION TECHNOLOGIES IN LIBRARIES

All libraries employ a variety of information technologies in support of their mission of "allowing people to utilize information."[16] The following section discusses the role of technologies in libraries and reviews a few key information technologies and current applications. Emphasis has been placed on those technologies found in depository institutions.

Although over time the physical form of information has varied from manuscripts to audiovisuals, to online service, and to other technologies, the need of the librarian to access this information for users has remained constant. A library is an institution that acquires, manages, and disseminates information. Moreover, "a library is a bibliographic system regardless of the situation in which it is placed, and the task of the librarian is to bring people and graphic records together in a meaningful relationship that will be beneficial to the user."[17]

Information technologies offer libraries opportunities and capabilities for enhancing their current services and for allowing libraries to better fulfill their missions. As stated by Briscoe et al.:

> Technology has already changed the traditional way in which libraries operate, and this trend will continue. The library needs to persist in its role as a knowledge institution—mankind's archive and encyclopedia—while providing the necessary services of an information broker: computer literature searching, information retrieval, and document delivery.[18]

As libraries increasingly employ the technologies and expand access to all types and forms of information, the role of the library and information specialist will not diminish. In fact, the current role will likely increase. The advent of "user friendly" software available to users for accessing electronic information systems will increase the number of users in libraries and elsewhere, and at the same time many users will still require information specialists. For example, specialists in government information will: assist users in identifying sources to search, provide users with some assistance in using search technologies, and/or in some cases actually perform the search for users.

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[16] Turoff and Spector, op. cit., 1976.

[17] Pauline Wilson, *A Community Elite and the Public Library: The Uses of Information in Leadership* (Westport, CT: 1977), p. xii.

[18] P. Briscoe, et al., "Ashurbanipal's Enduring Archetype: Thoughts on the Library's Role in the Future," *College and Research Libraries*, March 1986, pp. 121-126.

These same technologies, by integrating government information into the full library collection, will increase both the use of government information and the use of the total resources of the library and other local, State, regional, and national information resources.

Information technologies are not "new" to libraries. A broad range of technologies have been employed by them for years and have affected all aspects of library operations and services. In fact, it has been noted that: "Almost every function carried out in a library has been altered to some extent by electronics, computerization, and telecommunications."[19] Software is available for most aspects of library operations: circulation, inventory, acquisitions, periodicals, cataloging, and reserves. The use of technologies for information user services has resulted in the formation of library networks, and has spurred the development of national databases, thus allowing faster and more efficient access to information.[20] "The changes brought about by advances in technology have been so extensive that it is difficult to assess their total effect, but it is clear that libraries are in a stage of fundamental transformation."[21] Generally, library automation refers to systems and technologies that provide improved access to resources within a library, whereas information automation refers to systems and technologies that provide access to resources outside the library.

A growing range of information technologies are regularly employed in all types of libraries, though the cost of some of these needed technologies is still prohibitive for many libraries, due to fiscal constraints.[22] Library funding comes from a number of sources, including State, local, and Federal governments, all of which have experienced reduced revenues. This, in turn, has affected libraries and their ability to purchase new systems.

These technologies and technological applications are merely machines or processes for distributing information—the content does not vary, though one can do more and different things with information in electronic form than in paper form. As noted by the Commission on Freedom and Equality of Access to Information:

> . . . the new technology not only gives potential users quicker and more convenient access to wider bodies of information, including instantly current information, than can be provided by print alone; it also gives the user a new kind of ability to search through and manipulate the information, and in effect to create new information by the selection, combination, and arrangement of data. Moreover, the user can alter the data in a kind of two-way transaction.[23]

A variety of technologies are found in depository libraries, though not always in the documents collection. The amount or types of technologies available reflect, in some respects, the parent institution. Twenty-three percent of the depository libraries are public libraries, 55 percent are academic research institutions, 7 percent are Federal libraries, 11 percent are law school libraries, and 4 percent are special institutional affiliations such as special libraries and historical societies.

Use of Specific Technologies

In a 1984 survey of depository libraries, the Ad Hoc Committee on Depository Library Access to Federal Automated Databases (appointed by the Joint Committee on Printing [JCP]) concluded that:

> . . . there is a wide array of computer equipment already in place in depository libraries or their parent institutions, and that many of the libraries regularly make use of time-sharing services for searching databases, both Government and non-Government.[24]

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[19] Barbara Moran, *Academic Libraries, The Changing Knowledge Centers of Colleges and Universities* (Washington, DC: Clearinghouse on Higher Education, 1984) p. i.

[20] U.S. Congress, Office of Technology Assessment, *Information Technology and Its Impact on American Education* (Washington, DC: U.S. Government Printing Office, November 1982) p. 238.

[21] Moran, op. cit., footnote 19.

[22] For those institutions unable to afford a "new" technology, the user's access to desired information may be limited as some information is not available in more than one format.

[23] American Library Association, Commission on Freedom and Equality of Access to Information, *Freedom and Equality of Access to Information* (Chicago, IL: 1986), p. 31.

[24] U.S. Congress, Joint Committee on Printing, *Provision of Federal Government Publications in Electronic Format to De-*

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Since that survey, more depositories have adopted information technologies.[25] As indicated in the GAO Survey of Federal Information Users, for the 403 responding of the 451 depositories surveyed, libraries were equipped as shown in Table 6-1.

Depository libraries employ one or more of the following technologies and/or technological applications: microcomputers, online data services (bibliographic, numeric and others), networks such as OCLC (Online College Library Center) and RLIN (Research Libraries Information Network), automated information systems, electronic bulletin boards, optical disk technologies such as videodisk and CD-ROM, facsimile, and microfiche and related equipment. (A discussion of microfiche can be found in a following section on the format of materials in the depository library program.) These are the primary technologies and technological applications in use today and those most likely to be found in libraries within the next 5 to 10 years.

In a 1984 survey, over 5,000 public libraries, 1,600 academic libraries, and more than 7,000 special libraries were using microcomputers for a variety of information automation and library automation tasks. In addition, there were over 140,000 microcomputers in elementary and high school libraries. Recent survey data, including the GAO Survey of Federal Information Users, indicate further growth and purchases by libraries. A recent survey discovered that the mean expenditure spent on library automation per library over the past 5 years was $38,000. As in the 1984 survey, word-processing software continues to be the most popular software, followed by software for database management purposes and statistical uses in academic, public, and special libraries. School libraries prefer word processing as well, though statistical, database, inventory, graphics, and spreadsheet software are also used in these institutions. PC's are employed in support of administration, cataloging, and reference purposes the majority of the time.[26]

Table 6-1.—Depository Library Access to Information Technology

Technology	Number of Libraries with Equipment
Microcomputer without modem	283
Microcomputer with modem for online access	337
Microfiche reader without printer	352
Microfiche reader with printer	384
CD-ROM reader	169
Videodisk player	72
Mainframe computer	149

SOURCE: GAO Federal Information User Survey, 1988.

Online Database Services

Online database services, such as DIALOG, BRS, and other computerized retrieval systems, cover a wide array of continually expanding subject areas. Each database is a compilation of textual, statistical, and/or bibliographic information. Bibliographic and referral databases are sometimes called reference databases, whereas numeric and textual-numeric databases are called source databases. In 1979-80 there were 400 databases, 221 database producers, and 59 online services available. By 1987, there were 3,169 databases, 1,494 database producers, and 486 online services.[27] These services allow rapid access to information sources, can integrate information for the user, permit libraries greater flexibility in a choice of format, and provide access to previously unavailable information. Use of these services also allows the library to be less dependent on paper or hard-copy indexing materials. These services are a primary means of accessing certain types of government information not found elsewhere (e.g., government

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pository Libraries, Report of the Ad Hoc Committee on Depository Library Access to Federal Automated Databases (Washington DC: U.S. Government Printing Office, 1984) p. 3.

[25] Discussions with Joseph McClane, Chief Library Inspection Team, LPS, and Mark Scully, Director, Library Programs Service, U.S. Government Printing Office, Dec. 8, 1986.

[26] Survey data from Cahners Research, September 1986, and "Table 1," *Library Journal*, November 1986, p. LC8.

[27] Cuadra Associations, *Directory of Online Databases* (New York, NY: 1986) vol. 7, No. 3, p. v.

information found only in an online format, such as some Bureau of the Census data).

Online bibliographic services usually require a trained searcher to search the databases effectively, and also to limit search time and associated costs. A number of vendors and institutions, such as NLM and academic institutions, have introduced user-friendly software that may reduce both the need for trained searchers and the costs of online searching.

Pricing policies for online services vary. Some services charge a monthly fee (e.g. $200 per month), as well as connect time ranging from $4.00 to $45.00 per hour and system use charges ranging from $.03 to $.90 per unit of computer processing time. There may also be disk storage costs incurred with certain services. Prices of online services are most commonly based on hourly connect charges in addition to telecommunication costs for access to the network. These connect charges range from $15 to $300 per hour. If offline printing occurs, the user will typically pay per citation or page.[28] Online services are reexamining connect-time pricing due, in part, to the increase in transmission speeds. With the increase in transmission speeds (from 110 bps to 300 bps in the 1970's to up to 2,400 bps or higher today), users can perform more in-depth searches, download, or print in a more cost-effective manner. NLM and Mead Data Central have revised their pricing schedules to account for this shift. For example, NLM now has a lower connect fee, and charges according to the characters transmitted and the work performed on a given search by the NLM computer.

A number of Federal agencies produce databases consisting of original statistical information. Agencies such as the Bureau of Census provide computer tapes of their information, sometimes, in lieu of the paper format. Use of these numeric databases allows the librarian to both provide the needed information to the patron directly and be able to manipulate the data to the extent desired. In general, the GAO Survey of Federal Information Users found that depository institutions use online services primarily for bibliographic and statistical information. Regular library use of many of the Federally generated databases available through commercial vendors is limited because of the relatively high costs. Online systems, such as DIALOG and BRS, have introduced new services for "after hours" users that can substantially reduce the costs of online searching, if a library can accommodate requisite scheduling changes.

Library Communication Networks

Two or more libraries may form communication networks utilizing information technologies to enhance the exchange of materials, information, or other services. The formation of local, State, regional, and national networks has significantly altered the operation of libraries. There are several types of networks—bibliographic utility, regional service organizations, and others (which include State-wide publicly funded networks, local or geographically concentrated multi-institutional networks, and sub-regional subject-oriented networks). AMIGOS, SOLINET, CLASS, and the like are regional service networks that facilitate the expansion of the bibliographic utility. Although bibliographic utilities began as a means for libraries to reduce costs of cataloging, their primary function today is for sharing of resources. One example of a bibliographic utility is OCLC, a major computer-based cooperative network with over 7,900 members and employed by all types of libraries nationally and internationally. The OCLC network assists librarians in acquiring and cataloging materials, ordering custom-printed catalog cards, initiating interlibrary loan, locating materials in member libraries, and gaining access to other databases. More and more depository libraries are using the OCLC database for reference purposes to assist in searching for government documents. The GPO Library Division catalogs government documents into

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[28] Ibid., pp. v-vi.

OCLC where they can be searched by member institutions.[29]

These networks are undergoing changes in their structure and functions. Areas affected include autonomy for members, changes in the telecommunication infrastructure, decentralized versus centralized control, the development of more integrated systems for libraries that permit less reliance on the utility and greater emphasis on local resource sharing, and finally, the debate concerning ownership of data found in the shared cataloging databases. As a result of network changes, libraries are being changed as well.[30]

Automated information systems are those that assist the librarian in performing specific library tasks such as circulation, inventory, acquisitions, cataloging, administration, budgeting, personnel, and more. Many depository libraries use OCLC to perform many of these tasks because they lack access to other dedicated systems or necessary software. An example of an automated information system at NLM is DOCLINE. This is the Library's automated interlibrary loan request and referral system that automatically routes an interlibrary local request through the Regional Medical Library Network. Requests for titles found in SERLINE, the Library's online database of approximately 66,000 serial titles, are also automatically routed, based on the holdings of SERHOLD, NLM's National Biomedical Serials Holding database, which contains the holdings of 2,276 libraries.

Electronic Bulletin Boards

Libraries are employing electronic bulletin boards in support of library operations such as interlibrary loan (ILL), resource-sharing functions, and for access to current information located elsewhere. The Wisconsin Interlibrary Service (WILS) network is one example of the growing use of bulletin boards in libraries. The WILS network is used by over one-half of the 55 member libraries, a combination of public library systems and State library resource centers, in the Wisconsin library system. WILS can handle over 90,000 requests a year. Users note the following advantages:

- it is inexpensive and, in fact, is less costly than the previous system;
- it offers increased speed of communication;
- many members had the necessary equipment (microcomputers and modems) and, therefore, it did not require special equipment or hardware purchases;
- it has the capability to store and track the requests in a database;
- it reduces the amount of paper used to support the ILL system; and
- it enhances microcomputer use by library staff.[31]

Libraries are also subscribing to bulletin boards containing government information. These boards contain timely information produced by agencies. For example, the SRS Remote Bulletin Board System (RBBS) of the National Science Foundation contains information on financial and human resources for science and engineering activities. Also included is information concerning current studies of the Foundation, announcements of available publications, and comprehensive statistical tabulations. Specific data contained within the file include: "Federal Funds for Research and Development," "Scientific and Engineering Expenditures at Universities," "Employment and Demographic Characteristics: U.S. Scientists and Engineers," and "International Comparisons of Science and Technology Data," among others.[32] The GAO

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[29] Because GPO has been inputting to OCLC since July 1976, a limited amount of retrospective searching is possible, though it has been extensively noted that these early GPO cataloging records contain numerous errors.

[30] Moran, op. cit, footnote 19.

[31] Cathy Moore, "Do-It-Yourself Automation: Interloan Bulletin Boards," *Library Journal*, vol. 112, No. 18, Nov. 1, 1987.

[32] National Science Foundation, "Remote Access to Science Resources Studies Data", 1987.

Survey of Federal Information Users found a minimal use of electronic bulletin boards by those surveyed. The predominant library use was for press releases and statistical data.

Optical Disks

In a 1985 survey by Link Resources Corp., 7.6 percent of the libraries contacted had one or more videodisks or CD-ROMs. Sixty-five percent of those responding forecast a purchase of optical disk technology by 1990.[33] The GAO Survey of Federal Information Users found that 169 of the 403 depository library respondents had access to a CD-ROM player. Libraries are adopting optical disk technologies for both operational or technical services purposes and for reference services. In fact, the ". . . library and information communities are at the forefront of testing the various optical media—videodisk, CD-ROM, and optical digital disk—in digital data publishing and storage applications."[34] These technologies can provide improved access to a variety of information tools and sources, are a means of preserving important documents and information, and appear to be popular with users.

Optical disk technologies include videodisks, compact audio disks, CD-ROMs, optical digital disks, and others. This discussion will focus on videodisks and CD-ROMs. With regard to videodisks, the very large storage capacity and the ability to carry both video and audio information, are the two key characteristics that make videodisks attractive technologies for libraries. There are a number of types of videodisks with different capabilities. The laser optical videodisk is the most accepted technology. One indication of wider acceptance of this technology is the recent drop in the price of products as more data files are introduced and competition increases.[35]

The MINI MARC produced by Library Systems and Services is an example of a technical service application in videodisk format. The MINI MARC cataloging system is published on two videodisks containing over 2.1 million Library of Congress MARC records—1.5 million MARC records on 52,900 video frames on the first disk, and over 600,000 MARC records on 27,000 frames and 17,000 video frames of index data on the second.[36] The videodisk is updated twice a month. ALDE (Applied Laser Disk Efficiencies) Publishing produces the *United States Code* (USC) and the *Code of Federal Regulations* (CFR) using digitally encoded videodisks. These materials are available on disk and can be broken out into specific areas of Titles of Interest. For example, Title 26 (tax code) of the CFR is available annually with monthly updates.[37] Another example is IAC's Government Publications Index on videodisk, which indexes the Monthly Catalog from 1978 to the present with monthly updates.

CD-ROM, an optical storage device, "uses the differential reflection of light from a mirror-like disk surface as a means of reading information."[38] The following factors make CD-ROMs increasingly popular, particularly in libraries and for database creators:

- storage capacity,
- durability and stability,
- cost compared to magnetic tape and microfiche,
- fixed searching costs,
- the ability of users to perform the searches themselves without a trained librarian to assist, and
- size and compactness of the disk.

Despite a lack of common information access and retrieval standards, an increasing number of vendors are introducing database services on CD-ROM.

Use of a CD-ROM usually requires an interactive system consisting of a microcomputer, a ROM disk, and a disk drive. Reference materials and large textual or statistical databases are ideal candidates for the CD-ROM format in some libraries and information centers. Reference materials are especially well suited to CD-ROM because they save shelf space and do not require frequent updating.

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[33] Judy McQueen and Richard W. Boss, *Videodisk and Optical Disk Technologies and Their Applications in Libraries, 1986 Update* (Chicago, IL: American Library Association, 1986), p. 105.

[34] Ibid., p. 3.

[35] Ibid., pp. 9-36.

[36] Ibid., p. 115.

[37] Ibid., p. 127.

[38] Donald Case and Robert Powers, *Optical Disk Publication of Databases: A Review of Applications for Academic Libraries*, (Washington, DC: Council of Library Resources, 1986), p. 4.

Books in Print and *Ulrich's Periodicals Directory* are now available from R.R. Bowker in CD-ROM format. In a joint venture with Online Computer Systems Inc. who developed the search software, the *Books in Print Plus* service includes all of the multivolume *BIP*, the *Subject Guide to BIP*, *BIP Supplement*, *Forthcoming Books* and *Subject Guide to Forthcoming Books*, in addition to names and addresses of book publishers. This is contained on one disk. *Ulrich's Plus* on CD-ROM includes 68,000 periodicals, in alphabetical order by title, in 557 subject categories.

Online databases are also available on CD-ROMs. The primary advantage of having these databases on disk is that the user may sit at a terminal for any length of time and not incur high connect charges. This allows the untrained user to perform his/her own search. This user-oriented characteristic of CD-ROM explains some of the technology's popularity. In fact, many libraries find the need to place a time limit on the workstations due to the popularity of using these disk files. AGRICOLA, the database compiled by NAL containing citations on agriculture and related topics, is available on CD-ROM from $950 annually with a quarterly update. Another government-generated database, ERIC (Educational Resources Information Center), is also available from $1,750 with quarterly updates. The acceptance by users of the CD-ROM technology has been rapid, and as a consequence, vendors are quickly responding through the introduction of new products.

The Library Corporation markets Library of Congress (LOC) MARC databases in disk format. The BiblioFile Catalog Production System contains over one million Library of Congress MARC records on four disks. The user can search, edit, create, and save MARC records, display the catalog card image, print cards, transmit records, and more. Brodart markets the *Le Pac: Government Documents Option* on CD-ROM. This service also uses GPO/LOC MARC records, and provides a public access catalog of about 230,000 titles of depository and nondepository titles from 1976 to the present on an annual subscription basis with bi-monthly updates. Auto-Graphics GDCS also produces a government documents catalog on CD-ROM with monthly cumulated updates.

There are a number of other factors to be considered by libraries as this technology is introduced. CD-ROMs cannot be updated unless a new disk is mastered. Therefore CD-ROMs are not practical for time-sensitive data. Access time to CD-ROMs varies, and this may limit the number of users able to use the system concurrently. Different databases require different access software and indexing structures. The use of different search and retrieval software packages by vendors results in difficulty for librarians when "putting up" a new disk. This requires additional expertise and training on the part of the libraries. Finally, a microcomputer or PC and a CD-ROM reader are necessary, and this may represent additional expense to the library. However, many libraries already have or will be purchasing microcomputers.

Facsimile

Facsimile is the transmission of printed information (e.g., a letter, order form, interlibrary loan request) from one locale to another by encoding the printed materials into digitized form. The information is converted (or decoded) back to its original form once it is received. Current generation digital facsimile machines are able to transmit one to three sheets of 8½ by 11-inch paper per minute. This is a substantial improvement over analog machines that were only able to transit one page every 6 to 7 minutes. Facsimile machines are a very quick method of relaying information between libraries. The NLM facsimile program is an example of how this technology is currently used. NLM and a number of medical libraries are participating in an interlibrary loan program whereby NLM will send up to 20 pages of library material to a member library in support of emergency patient care. A small amount of information is relayed quickly—this is not a printing-on-demand program for lengthy documents. The project is limited to emergency medical care for a number of reasons: a broader project could overwhelm the NLM interlibrary loan staff, the cost could be prohibitive, and the majority of requests are satisfied by the regular interlibrary loan program. Another example is the use of facsimile machines by GPO field offices. Field offices send notices of printing requisitions via facsimile to the GPO Library and GPO Sales Program. The GPO Library and Sales Programs select items to be included in their respective programs and advise the field offices via facsimile of the items and number of additional copies to be printed.

Summary

In summary, information technologies individually and collectively are changing the nature of access to government documents via libraries and have the capability to improve access to government information. They can provide timely and accurate information to library users in a variety of formats and for various purposes. For instance, as noted earlier, surveys show that all types of libraries are purchasing microcomputers in increasing numbers for a variety of purposes. The GAO survey demonstrates the growing technology base in depository libraries and how new technologies such as CD-ROM are becoming more widely accepted and used.

Most importantly, information technologies permit access to a much greater range of information and resources, including government information through vendor (profit and not-for-profit) services. New types of Federal information resources, such as statistical/numeric databases from the Bureau of the Census, are now online and available to libraries through the use of information technologies and vendors. Newer technologies such as CD-ROM are moving quickly from the marketplace to libraries as producers place more and more services in a CD-ROM format. Libraries are experimenting and employing these technologies in support of their operations, which, in turn, permits the user greater access to needed information.

FEDERAL DEP[illegible]RY LIBRARY PROGRAM

In 1813, Congress established a syst[illegible]r the distribution of congressional literature, and this system developed into the depository library program—a significant avenue for dissemination of government information to the public. The program has experienced a number of changes since its inception, and is still changing as participating libraries and managers of the program at GPO debate how to best serve the users of the depository system. The following section provides a brief description of the origins of the program and its operations. This is followed by a discussion of three specific topics: 1) dual format distribution (paper and microfiche), 2) the dissemination of information in electronic format, and 3) online catalogs.

Origins and Operations of the Depository Library Program

There are approximately 1,400 Federal depository libraries in the United States and related territories. These libraries provide Federal publications without charge to the general public. This program is the primary avenue or "safety net"[39] for dissemination of government information to the general public.

The DLP originated in 1813 when a resolution was passed authorizing the printing of additional copies of congressional literature for distribution to State governments and legislatures. The following year, the American Antiquarian Society became the first depository library. Responsibility for the distribution of materials shifted among a number of government agencies prior to resting with GPO. Congressional resolutions in 1857 and 1858 affirmed the distribution of congressional materials to institutions such as libraries and colleges, and Members of Congress designated organizations within their districts as depository institutions. In 1895, a new printing act was passed, incorporating the old legislation and placing responsibility for bibliographic control efforts, distribution, marketing of public documents, and the DLP in the office of the Superintendent of Documents at GPO.[40] This legislation also specified that certain (not internal, confidential, or administrative) executive materials were to be included in the depository program. In addition, the act called for a catalog to be published each month listing government documents published the previous month. A number of other points in the legislation were central to the DLP—attaining status as a depository library could be gained either through congressional designation or through legal designation; and the Superintendent of Documents could now "investigate" depository libraries and evaluate their holdings vis-a-vis the program. It was not until 1923 that depository libraries were able to select those government documents most appropriate to their clientele.[41]

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[39] Office of Management and Budget, op. cit., footnote 8.

The Federal Depository Act of 1962 revised the previous legislation by:

- increasing the number of possible depository libraries;
- establishing a system of regional libraries (two per State), which were to maintain a permanent collection and provide interlibrary loan and reference services;
- providing for the transfer of certain documents within New York and Wisconsin to either the New York State Library or to the State Historical Society of Wisconsin;
- expanding the variety of government documents available for distribution; and
- establishing a reporting mechanism to ascertain the libraries' condition (the Biennial Survey became the reporting vehicle).

There have been two changes to the 1962 Federal Depository Act. The highest appellate court of each State became exempt from the requirement of public access in 1972, and law schools were eligible to become depositories under the law designation in 1978.[42] This legislation has expanded the total number of libraries in the program, since some of those law libraries already participating became members under the "law" designation thus allowing for new participants under the separate congressional designation. Another effect has been a substantial increase in law schools participating in the depository program; almost one-half of the new depositories between 1976 and 1985 were accredited law schools. The appointment of librarians and knowledgeable individuals to a Depository Library Council began in 1972 in an effort to assist the Public Printer and the Superintendent of Documents.[43]

One description of the Library Programs Service is that of a "production shop."[44] From this perspective, its purpose is to act as a transfer agent of government documents from Federal agencies to the member depositories. By law (as stipulated in Title 44), all documents produced by an agency that are not confidential, not for internal use, or not concerned with national security belong in the depository program. In fiscal year 1986, 66,367 titles or 27 million copies of government documents were distributed to depository libraries. GPO staff state that the workload of the program has remained relatively constant for several years. GPO staff estimate that an additional 5 percent of the 66,000 titles or about 3,000 titles are fugitive documents—those belonging in the program but not included by the agencies.[45]

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[40] The General Printing Act of 1895, ch. 23, 28 Stat 601 (codified as amended in scattered Sections 44 U.S.C.).

[41] Peter Hernon, Charles McClure, and Gary Purcell, *GPO's Depository Library Program A Descriptive Analysis* (Norwood, NJ: Ablex Publishing Corp., 1985), pp. 5-8.

[42] Ibid., pp. 5-8.

[43] Hernon, McClure, and Purcell, op. cit., footnote 42, p. 14. An earlier Council was formed in the 1960's.

[44] Discussion with Mark Scully, Director, Library Programs Service, and Donald Fossedal, Superintendent of Documents, U.S. Government Printing Office, Dec. 8, 1986.

The operating cost of managing the depository program is provided by the GPO in the annual budget. In fiscal year 1987, the budget for the depository program was $19.7 million, and the fiscal year 1988 estimate is $20.2 million. DLP is managed by the Superintendent of Documents. The principal mission of this office is to "distribute government documents, and information about them for the three branches of government."[46] The DLP is managed directly by the Library Programs Service (LPS), within the Office of the Superintendent of Documents. The Joint Committee on Printing (JCP) oversees the policies and overall direction of the program.

Until recently, the *Guidelines for the Depository Library System* recommended that libraries (other than regionals that receive one copy of all documents distributed) select a minimum of 25 percent of available documents, and approximately 50 percent of the depositories select no more than 25 percent of the available government documents. It is predicted that ". . . the U.S. Government Printing Office will distribute approximately 20,000 paper documents and 43,000 on microfiche each year."[47] For those libraries selecting the minimum number of government documents, this represents approximately 15,000 documents per year—requiring an enormous investment in space, collection maintenance, and staff time by participating libraries. GPO, through a legislative branch appropriation, is responsible for the cost of distributing these materials to member institutions if GPO prints the documents. If another agency prints documents on its own premises or elsewhere, that agency is then responsible for the cost of printing copies for depository distribution, with GPO bearing the distribution costs.

Over the past several years LPS, the Depository Library Council, and members of the depository library community have debated the availability of government information in different formats in the depository library program. There are two debates regarding format— the dual format debate that concerns materials distributed in paper and microfiche with libraries selecting either format; and the debate about inclusion of government electronic information products in the program. Both debates are concerned with *meeting user preferences* on format, with the costs of providing these products, and with ensuring access to government information regardless of format. The focus of both debates is the *accessibility* of the information and *availability* of the information.

Format of Depository Library Materials: Paper v. Microfiche

Materials sent to depository library participants are either in paper format, microfiche, or a combination of both (although only regionals can receive a title in both formats). Beginning in the early 1970s, the JCP and GPO began to explore the advantages and disadvantages of instituting a microfiche publishing program for depository materials. In 1977, following a number of library surveys and committee evaluation efforts, the JCP gave permission to GPO to begin conversion of selected depository materials to a microfiche format to effect cost savings for the program and for participating libraries. Private information providers objected to this practice at the time because it was their stated position that the library community was already well served by private sector firms. At issue was the difference in the scope and amount of materials to be offered by GPO in contrast to those available from the private sector. Members of this community, as represented by the Information Industry Association (IIA), believed that provision of free microfiche to depository institutions would undermine their business, and voiced concerns that the Federal Government would be the "sole" information provider to libraries and other users of Federal information.

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[45] Fugitive documents continue to be a problem for the program, although members of the Library Programs Servicce believe the number is declining. However, it has been noted by members of the depository library community that the number of fugitive documents is increasing, at the same time that the number of materials in the depository library program is decreasing.

[46] Government Printing Office, *Government Printing Office, Superintendent of Documents Description, Draft*, (GPO, 1986), p. 1.

[47] Donald Case and Kathleen Welden, "Distribution of Government Publications to Depository Libraries by Optical Disk," *Government Publications Review*, vol. 13, 1986, p. 314.

Since that time, the LPS has adopted a policy of providing more and more documents in microfiche format, primarily for financial reasons. Reduced production and postage costs of microfiche, compared to paper, allow savings for the program. Many libraries have adopted microfiche to both achieve greater access to a broader range of government materials and reduce their maintenance costs. Housing of paper can be quite costly. In turn, use of microfiche has reduced the financial burden on GPO. In the spring of 1986, 54 percent of the materials sent by GPO to member institutions were in microfiche, and the number is increasing. By December of 1986, 61.2 percent of the materials were in microfiche.[48] In addition, a number of agencies send their microfiche materials directly to library participants, based on interagency agreements resulting in a more decentralized operation. The Department of Energy sends copies of microfiche concerned with technical R&D information directly to participating depository institutions, and the U.S. Geological Service (USGS) ships cartographic microfiche materials for themselves and the Defense Mapping Agency (DMA). The Equal Employment Opportunity Commission (EEOC) also provides agency decisions in microfiche to depositories via its contractor, IHS. EEOC pays the production costs and is responsible for sending out the materials; GPO reimburses the EEOC for postage costs.

There is a continuing debate between the LPS, member institutions, and the JCP over what proportion of materials and which materials will remain in hard copy. In August 1983, the Superintendent of Documents issued SOD 13, a list of criteria for determining which documents were more appropriate in microfiche or paper format. Criteria include physical characteristics (color, size, etc.,), timeliness, audience, frequency and type of use, savings in space, historical significance, and reference value. This directive recognized that certain documents are more suited to either paper or microfiche and some documents to both formats. Depository librarians also recognize that some conversion to microfiche is helpful in order to reduce program costs, save space in participating libraries, and make more information available to the public. The Depository Library Council and the Public Printer continue to work together to identify materials that can be converted to microfiche and those that must remain in dual format (that is, distributed in both paper and microfiche). The JCP passed a resolution on April 9, 1987 supporting choice of format for depository institutions.

Dual format documents are the most heavily used titles in the majority of depository libraries, and "are the fundamental records of Government."[49] Secondly, it is important that libraries receive dual format items such as the *Federal Register* in a timely fashion so that users can respond to proposed regulations within a 30-or 60-day timeframe. The delay resulting from conversion from paper to microfiche format and subsequent shipment can sometimes make a timely response impossible. Third, the format of some key documents, such as the *Code of Federal Regulations*, does not lend itself to use in the microfiche format. Given the high usage of key documents, the need for receiving these documents in a timely fashion, and ease of access to information contained in the paper documents versus microfiche, it is understandable why a paper format is preferred.

Library use of microfiche has a number of advantages and disadvantages. On the plus side, microfiche is an enormous space saver; consequently, more government information can be made available at the depository. Small colleges and public libraries in particular benefit from the distribution of government materials in microfiche, and access is improved since many of these institutions otherwise could not afford to store the materials. The use of microfiche also permits libraries to retain more information for longer periods of time or permanently. It is projected that, "... libraries that accept all depository publications distributed over the next 20 years will require an estimated 7,500 linear feet of hard copy storage and 2,500 linear feet of microfiche storage."[50]

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[48] Discussion with Mark Scully, Director, Library Programs Services, GPO Dec. 8, 1986.

[49] Conversation with Judy Myers, University of Houston Library, June 17, 1987.

However, microfiche also has disadvantages. Librarians are finding that patrons prefer paper to microfiche as there are:

> ...problems with viewing and reproduction equipment (that) have resulted in user complaints of eye strain and unsatisfactory paper copies.[51]

The cost to the patron is at least double when duplicating pages from microfiche, compared to copying paper documents, and the range of costs to the library for the purchase of a microfiche reader/printer from Kodak, for example, is between $1,500 and $5,000, plus maintenance fees. Also, there are added difficulties in the organization and bibliographic control of fiche.[52] Another consideration is that conversion of a document to microfiche by GPO adds 4 to 8 additional months to the processing time prior to the document being shipped out. GPO has stated that time-sensitive materials will not be included in the microfiche program due to this extra delay.[53]

The dual format issue exacerbates two somewhat competing and contradictory philosophies of the depository library program. To many, the GPO program is simply one that transfers materials from the government to participating institutions. To others, the program is one that provides timely and informative government materials to citizens in support of the principle of public access. To those adhering to the access philosophy, the adoption of microfiche as the predominant format negates both the accessibility and timeliness objectives of the program.[54] Dissatisfaction with the microfiche format by library patrons and the added delay of conversion from hard copy to microfiche are cited as critical factors.[55]

An added difficulty in resolving the dual format distribution debate is the poor but improving relationship between the managers of the DLP and members of the depository library community. There has been some improvement in the relationship since the LPS began upgrading the quality of the GPO cataloging tapes, the inspection program, and pertinent training programs and seminars, among other areas. On the other hand, GPO's failure to resolve problems with its microfiche contractor has exacerbated its relationship with depository libraries.

Dissemination of Information in Electronic Format

Microfiche and hard copy materials are the only formats employed to date by GPO in the transfer of government information to depository institutions (except for the planned shipment of the Bureau of the Census CD-ROM "Test Disk No. 2" to the depositories).[56]

GPO is currently reformulating agency policies with respect to electronic dissemination in the depository program. Prior agency decisions to withhold electronic information from the program were based on a GPO interpretation of previous legislation concerning the depository program, specifically section 1901 of the 1962 Depository Act. The opinion by former GPO general counsel Garrett Brown determined GPO policy:

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[50] Case and Welden, op. cit., footnote 45, p. 315.

[51] Ibid.

[52] Discussions at the Depository Library Council Meeting, Oct. 15-17, 1986.

[53] Discussion with Mark Scully, op. cit., footnote 45. An LPS microfiche contractor has defaulted on the contract, causing extensive delays in the creation and distribution of microfiche to the depositories.

[54] IIA supports the continuation of the dual format programs because it recognizes the need for items used more heavily to be available in paper due to ease of access, patron preference, and timeliness.

[55] Discussions and meetings, GODORT, American Library Association Midwinter Meeting, Jan. 16-19, 1987, Chicago, IL.

[56] GPO has agreed to "ride" the Census "Test Disk No. 2" order and ship copies of this CD-ROM to all depository institutions. The Census of Agriculture for 1982 and the Census of Retail Trade by Zip Code will be included on this disk.

> . . . the Depository Library Act [of 1962] does not direct [the] Superintendent of Documents make published documents available in all possible formats to the libraries. It was the intent of Congress that only printed publications would be made available to depositories.[57]

GPO now supports the position that, while it cannot require agencies to submit electronic products for distribution through the depository system, agencies may voluntarily submit electronic products to GPO. Also, those electronic products available in paper or microfiche format can be disseminated to depositories in electronic format since these materials have already been "published."

The recent plan to distribute a Bureau of the Census CD-ROM to depositories prompted the Public Printer to request approval from the JCP and clarification of the Committee's views concerning dissemination of government information in electronic formats to depositories. In a March 25, 1988 letter to the Public Printer, Congressman Frank Annunzio, Chairman of the JCP, affirmed both the Committee's support of the Census project and the position that the GPO's authority as required by Title 44, *United States Code*, extended to the "production and distribution of Government publications in these new formats."[58]

GPO and the JCP recently developed a research plan that identifies selected electronic data files as products for depository distribution. This plan was approved by the JCP on June 29, 1988. The demonstrations involve a combination of online and CD-ROM government data files. The Subcommittee on Legislative of the House Committee on Appropriations supported dissemination in CD-ROM formats in the fiscal year 1989 Legislative Branch Appropriation Bill and requested a copy of the GPO-JCP plan. In addition, the Committee noted that online access and other formats (excepting CD-ROM) may require additional funding, and requested that GPO submit any future electronic dissemination plans to the Subcommittee on Legislative.[59]

The JCP position on the dissemination of government information in electronic form resulted in part from the deliberations of the Ad Hoc Committee on Depository Library Access to Federal Automated Databases. The Committee's efforts were based on a request from the JCP to: ". . .evaluate the feasibility and desirability of providing access to Federal Government information in electronic formats to depository libraries." The Ad Hoc Committee has considered a variety of formats, databases, and institutional arrangements for the provision of agency information for the past 4 years.[60]

This advisory committee intended to recommend to Members of the JCP certain agency databases for depository distribution in online or CD-ROM format to test electronic dissemination to depositories. These recommendations were to be based, in part, on proposals made by each agency to the JCP. As of December 1986, 16 proposals were received by the JCP from Federal agencies hoping to participate in the pilot program.[61] These proposals ranged from provision of 4 possible databases from the U.S. Geological Survey—the Geologic Map Index, the Library System Catalog, the Mineral Resources Data System, and the Selected Water Resources Abstracts—to 3 databases from the Department of the Treasury—

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[57] U.S. Congress, Joint Committee on Printing, *Provision of Federal Government Publications in Electronic Format to Depository Libraries*, Report of the Ad Hoc Committee on Depository Library Access to Federal Automated Databases (Washington, DC: U.S. Government Printing Office, 1984), pp. 112-113.

[58] Letter from the Honorable Frank Annunzio, Chairman, Joint Committee on Printing to the Honorable Ralph Kennickell, Jr., the Public Printer, Mar. 25, 1988.

[59] U.S. Congress, Committee on Appropriations, *Legislative Appropriations Bill, 1989, Report to accompany H. R. 4587, Report No. 100-621*, 100th Cong., 2d session, 1988.

[60] The Ad Hoc Committee is composed of individuals from government agencies and representatives of pertinent associations.

[61] The JCP is still receiving new pilot project proposals from Federal agencies interested in providing electronic products to depository members.

the Financial Management Database, the Internal Revenue Bulletin, and the Taxpayer Information Publications.

One goal of the pilot and demonstration projects was to permit depository institutions access to some agency data not previously available or data that were lost once converted to an electronic format. It would also open up the depository program to government information in electronic form. The JCP passed a resolution on April 9, 1987, accepting the recommendations of the Ad Hoc Committee in principle and "urged" GPO to initiate pilot projects.

Despite the April 9, 1987 resolution, a fiscal year 1987 funding request of $800,000 for the initial round of pilot projects was deferred by the Appropriations Committees of both the House and Senate. GPO did create the Information Technology Program within LPS, with internal funds, to prepare the depository program for electronic projects, gather information on Federal agency electronic programs, and assist internal LPS operations.

The introduction of electronic formats to the depository library program has been characterized as:

> . . . an opportunity to make Government information useful and more timely, and, . . . an opportunity to achieve a higher level of service to constituents.[62]

This proposal has been endorsed by the American Library Association, Special Library Association, American Association of Law Libraries, Association of Research Libraries, National Coordinating Committee for the Promotion of History, Medical Library Association, Cartographic Users Advisory Council, and others representing thousands of libraries around the country. Many depository librarians also view the pilot projects as a chance to test a variety of electronic formats, and discover which one or combination of technologies and formats (electronic, paper, and microfiche) are appropriate for different kinds information. Finally, provision of information in an electronic format is seen as a continuation of the current multi-tiered approach to disseminating government information: provision of information directly to the individual by government, provision of information via the private sector through a number of services, and provision of information through the GPO document sales program and the DLP. This three-tiered approach recognizes that there are both different markets and different users for this information, and that these three modes of delivery are not necessarily competitive and, in many respects, are complementary.

Some database producers and services object to the inclusion of electronic formats in the depository program as proposed in the pilot project program. The private sector position is represented, in part, by the Information Industry Association (IIA), a trade association with over 450 members from the publishing and information sectors of the economy. These businesses employ information technologies to supply users, both public and private, with all types of information. The IIA has argued that provision of government information in electronic format via depository libraries, as proposed in the pilot project program, would compete with existing private sector online services, and that, if electronic formats are included in the depository program, they should be provided by private vendors. The Association has further stated that the depository program should comply with OMB Circular A-130 (though the legislative and judicial branches of government are not legally subject to A-130), and that the goals of the depository program should be developed and reviewed in much greater detail. Some members of the IIA also contend that, if government information in electronic format is disseminated through the depository program, private vendors will be unable to compete fairly and will suffer adverse economic consequences.

Online Catalogs

Some government information is available to depository libraries in electronic formats through a number of private and not-for-profit database and vendor services, such as DIALOG, BRS, and OCLC, and the number of these services is growing. The majority of the depository libraries have access to at least one of the database systems, such as DIALOG or BRS, and the majority are also planning future online catalogs.[63] Since 1976, LPS use of OCLC allows depository institutions and others to search OCLC and other online services for government documents for cataloging purposes, for downloading into library catalogs, and as a limited reference tool.

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[62] Discussions, American Library Association Midwinter Meeting, Chicago, IL., Jan. 16-19, 1987.

LPS is the "center of authority" for the cataloging of Federal documents (employing accepted Anglo-American cataloging rules [AACR2]), and is responsible for producing original cataloging records of Federal documents in a timely fashion. Once cataloged at GPO, the record is available online immediately. Each week, OCLC sends the computer tapes to GPO where they are consolidated by the GPO Data System Service. Four computer tapes are again consolidated to produce the *Monthly Catalog of the United States Government Publications*. These GPO MARC tapes can be purchased from GPO and the Library of Congress by commercial firms and libraries.

As more and more libraries adopt information technologies, the promise of online catalogs is particularly appealing for government document collections. It has been noted that, "three developments seem to have had the widest impact on the overall effects of automation in academic libraries: the growth and development of bibliographic utilities, the changes brought about in information retrieval by the use of online databases, and the more recent development of online public access catalogs."[64] The 1981 Depository Library Biennial Statistical Summary found that only 70 depository libraries (or 6 percent of all depository libraries) catalog all government documents received, while 666 depositories (or 56 percent) catalog less than one-tenth of items selected. It has been noted that:

> . . . the resources required to catalog items and to maintain card catalogs in even a moderate-sized institution are so extensive that libraries have frequently chosen not to catalog documents in order to contain these costs.[65]

Whereas previously the combination of traditionally understaffed and low-budget document departments could not afford the enormous cost of cataloging the materials, new technologies now allow many to catalog both new and retrospective documents.

There are a number of commercial services available to libraries for cataloging of government documents, including retrospective materials. For example, Marcive and Brodart provide machine-readable tape, a microfiche catalog, or catalog card set records to depository libraries. The library identifies by a GPO item number those documents requiring a record, and the vendors will supply the record in the desired format. Vendors are also providing this service for retrospective government documents. This type of service presents the participating institution with new opportunities for creating online catalogs of Federal documents, as these tapes can be loaded into a library's local online catalog.[66]

Some GPO cataloging records, particularly from July 1976 to 1984 (when GPO began to include corrections made during the *Monthly Catalog* production process), contain errors that have not been corrected.[67] GPO does not generate retrospective corrections on the OCLC tapes for users, unlike the Library of Congress and other Federal library institutions. The added expense to a library of identifying and correcting a record is quite high—almost $4.50 per corrected record versus $1.40 per high-quality record such as those produced today. For example, it would cost about $495,000 to examine, identify, and correct the 110,000 GPO cataloging records at the University of Houston in order to include these records in the online catalog. Error-free, the cost of inclusion in the online catalog would be substantially reduced to $154,000.[68]

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[63] Conversation with Joseph McClane, Chief, Library Inspection Team, Library Programs Service, U.S. Government Printing Office, November 1986.

[64] Moran, op. cit., footnote 19, p. 8.

[65] Roseann Bowerman and Susan Cady, "Government Publications in an Online Catalog: A Feasibility Study," *Government Publications*, December 1984, p. 331.

[66] Conversation with Judy Myers, op. cit., footnote 50.

[67] For more information, see: Judy E. Myers, "The Government Printing Office Cataloging Records: Opportunities and Problems," *Government Information Quarterly* 2 (1985), pp. 27-56; Bowerman and Cady, op. cit., footnote 65; Mary Sue Stephenson and Gary Purcell," Current and Future Direction of Automation Activities for U.S. Government Depository Collections," *Government Information Quarterly* 3 (1986), pp. 191-199; and Margaret Johnston Powell, Deborah Smith, and Ellen Conrad, "The Use of OCLC for Cataloging U.S. Government Publications, A Feasibility Study," *Government Publications Review* (1987), pp. 61-76.

At those depositories where online catalogs are being created and/or catalog records are being generated, government documents are becoming more accessible as cataloging records are now integrated into the main catalog, and "... usage rates are going up."[69] As early as 1984, Trinity University noted a 300 percent increase in documents usage once records were included in the circulation system.[70]

In conclusion, the availability of retrospective GPO cataloging tapes and private and not-for-profit vendor services, combined with the increasing number of technologies in depository institutions, permits these institutions to catalog their government documents in a more cost-effective manner. This, in turn, increases access by patrons to government documents. In addition, it also allows these libraries to consider machine-readable catalogs. The advent of online catalogs in libraries in the next 5 to 10 years will revolutionize government document collections, as they will allow subject access to these materials by users utilizing electronic capabilities, and integrate the government information into the rest of the library's collection.

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[68] Ibid, Judy E. Myers.

[69] Discussions, American Library Association Midwinter Meeting, Jan. 16-19, 1987. There are materials that are still not accessible through the program; GPO does not catalog all materials it distributes, such as the DOE materials, and there are no plans for creating machine-readable records for those depository materials that predate 1976.

[70] Bowerman and Cady, op. cit., footnote 65, p. 341.

Chapter 7

Alternative Futures for the Depository Library Program

Photo credit: Documents Center, Robert W. Woodruff Library, Emory University

Documents librarian assists users with the Documents Center online catalog.

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Chapter 7

Alternative Futures for the Depository Library Program

SUMMARY

This chapter discusses several alternative futures for the U.S. Government Printing Office (GPO) depository library program (DLP) and examines their implications for the depository program and users of Federal information. The three alternatives considered are:

- maintaining the status quo (that is, the program as currently operating, excluding most electronic information products);
- incorporating electronic information products into the current depository library program; and
- reorganizing the depository program in the 2- to 10-year time period, to accommodate electronic formats and the adoption of current and emerging information technologies by libraries.[1]

Included in this chapter are case studies of electronic delivery of two data files—the *Congressional Record* and *Federal Register*. This chapter also discusses several key issues concerning the future of the DLP.

In 1962, Congress revised the laws relating to the depository program. Throughout the hearings and debate on the proposed legislation, Members and those testifying noted the "vital role" of the depository program in the dissemination of government information to the American people. One of the revisions accepted by Members was a provision to extend to the depositories access to additional government-produced materials, and Members noted that ". . . the Subcommittee on the Library considers . . . the expanded availability of documents to those depository libraries as absolutely essential if the purpose intended by Congress in the establishment of the original program is to continue to be served."[2] The debate today concerns not only additional materials but additional formats, and whether including electronic formats is consistent with the legislative history and statutory authority of the 1962 act.

With the increasing number of electronic dissemination projects in agencies as well as related private sector offerings, the impetus for including electronic information in the depository program is strong. Electronic products enhance access to many types of information, and failure to include these products within the depository library program could create or exacerbate inequities in public access to such information. The Joint Committee on Printing (JCP) has interpreted provisions of Title 44 of the United States Code as extending to government information in all formats and has endorsed pilot and demonstration tests and delivery of government information products in electronic formats. The Subcommittee on Legislative, Committee on House Appropriations, has approved the distribution of CD-ROMs to depository libraries. Thus, it seems clear that some electronic products will be included in the depository program. However, the number and types of products are likely to be quite limited, in the absence of further congressional guidance, since at present GPO is not empowered to require agencies to submit their electronic products for depository distribution. Thus, without further policy action, erosion of public access to government information via the depository libraries is likely to continue.

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[1] Throughout this chapter DPL refers only to the U.S. Government Printing Office depository library program; and the reorganized DLP alternative is based in part on the proposal developed by the Association of Research Libraries Task Force on Government Information in Electronic Format. For more information see: Association of Research Libraries, *Technology & U.S. Government Information Policies: Catalysts for New Partnerships* (Washington, DC: ARL, October 1987).

[2] U.S. Congress, Committee on Rules and Administration, *Revising the Laws Relating to Depository Libraries*, Senate Report No. 1587, 87th Cong., 2d sess., 1962, p. 25.

OTA has also concluded that the likely introduction of electronic information to the depository library program may require an examination of the current structure of the program and the nature of the relationships between depository participants and the government. Committees of Congress, member libraries, and GPO will need to assess the current organizational structure and operation of the depository library program and determine if it is the most effective and efficient system for users to access government information. Pilot projects and the like will provide useful information regarding user information needs, financial costs, administrative requirements, and levels of usage. These pilots will also assist the committees, GPO, and member institutions in designing new delivery and financing arrangements, particularly in light of the evolving nature of both libraries and the telecommunications infrastructure.

An important reason for electronic demonstration projects is to better understand the issue of costs to users, to government, and to depository institutions. **If the basic underlying principle of the depository program is to retain free access to government information for users, then Congress needs to appreciate that there may be additional costs associated with the introduction of certain electronic services, and Congress may have to assist depository libraries and GPO in designing and financing ways to make this information available to the public.** Case studies of two electronic data files, the final or bound *Congressional Record* in CD-ROM format and the *Federal Register* online, are presented to illustrate possible delivery modes and costs.

Distribution of selected government information products in CD-ROM format such as the bound or final cumulated edition of the *Congressional Record* could improve access to such information, and could be a cost-effective dissemination mechanism for the Library Programs Service (LPS) for certain data files. There could be some additional equipment and training costs associated with this format for the depository library participants. There will be a need to periodically review depository library policies as new formats are added, especially since budgetary constraints are not likely to permit multiple formats for many government information products. Difficult decisions will need to be made about which formats for the different products should be distributed to depository libraries.

In the longer-term, Congress may wish to consider a reorganization or restructuring of the current depository program in light of electronic information dissemination options now or likely to become available. This assumes that there is a fundamental need to reorganize the depository program to account for changes in how users access information and how libraries provide information to users. A reorganized depository program presumably would incorporate the "lessons learned" from the pilot projects and demonstrations. To this end, the pilots and other resource-sharing projects would assist depository librarians, GPO, the JCP, and other congressional committees in discussing and redesigning the current structure of the depository program to best serve the end-user—the public. Other issues, such as how best to serve the needs of rural users of government information and whether the depository program should remain within GPO or be moved elsewhere (e.g., to the Library of Congress), also could be examined during the reorganization discussions.

In the final section of this chapter, four closely related policy issues are examined. These issues concern the need for developing a clear information policy on access to government information in electronic format through depository libraries. In formulating policy it will be important to consider the following specific questions or issues:

- Should government information in all electronic formats be disseminated to the public through the depository library program?
- Are the principles of free access still applicable to the depository program, or are there new costs associated with the introduction of electronically formatted prod-

ucts such that user fees or new funding mechanisms need to be considered?

- Can the current depository system accommodate new responsibilities for electronic formats or should a new institutional structure be considered? and
- Does the increasing shift to electronically formatted information require a reexamination of the composition and relationships of the stakeholders in the depository program, and especially the role of the information industry?

INTRODUCTION

The first three major sections of this chapter explore three **possible alternatives** for the depository library program. These are maintaining the status quo, establishing an electronic depository library program, and developing a long-term, reorganized electronic depository library program based on new and emerging technologies and the changing nature of libraries and information needs of users.

The analysis of the alternatives and their possible implications is intended to facilitate an understanding of the possible choices available to policymakers. The three alternatives are presented and evaluated in some detail. In evaluating the alternatives, the effects of proposed changes resulting from the use of new technologies are given considerable attention.

Each of the alternatives is structured in terms of the five main functions of the Library Programs Service (LPS):

1. acquisition of materials;
2. classification of materials;
3. cataloging of materials;
4. distribution of materials;
5. monitoring of member depositories.

The discussion of monitoring includes consideration of internal LPS operations and is presented from the perspective of the quality of library service and access to Federal information.

The fourth section in this chapter discusses the possible dissemination of two data files to the depository libraries in electronic formats—the bound *Congressional Record* in CD-ROM format, and the *Federal Register* online. Finally, the fifth and last section in this chapter discusses four key issues relevant to the future of the DLP.

ALTERNATIVE I: STATUS QUO

The status quo is defined as a continuation of the current roles and activities of the DLP as described in chapter 6. The discussion below assumes that no major congressional or executive actions are taken for the next few years and:

- GPO disseminates information in paper and microfiche formats with a few CD-ROMs and a few online files; and
- depository libraries receive information from Federal agencies in paper and microfiche formats with few electronic formats.

DLP, within the Superintendent of Documents (SupDocs) at GPO, would continue to distribute government documents to approximately 1,400 participating depository institutions. The amount of government information that should belong in the program is projected to increase, but the actual amount distributed would probably decrease for two reasons—agencies failing to place paper documents in the program (fugitive documents), and an increase in the percentage of electronic products falling outside the program. The decentralized practice of agencies shipping materials directly to participating depository institutions would likely increase, as in the case of Department of Energy and Equal Employment Opportunity Commission agreements that are typical of arrangements between GPO, libraries, and the agencies (see ch. 6 for more information).

Classification of materials. There would be no changes in or effects on the classification of materials.

Cataloging of materials. There would be no changes in the cataloging of materials.

Distribution of materials. The bulk of government documents distributed to depository libraries would continue to be in microform format. Dual format (paper and microfiche) would continue for selected congressional and executive branch materials. GPO and the library community would likely revisit the debate over the choice and cost issues raised by dual format.

The Superintendent of Documents would maintain the practice of selling GPO tapes to vendors at a nominal fee. Neither these tapes nor the bulk of electronically-formatted materials from other government agencies would be distributed to depository institutions (except for a few CD-ROMs and online products). Depository institutions in need of electronically-formatted information would presumably purchase this information from vendors or through other arrangements directly with the agencies, for example, Bureau of the Census or National Library of Medicine (NLM).

Monitoring of the member institutions and effectiveness of the program. The budget of the LPS would likely remain relatively constant. If Federal agencies move away from GPO services (for whatever reasons, such as an increase in electronic products in lieu of paper) and, as a consequence, fewer government documents were available to the Sales Program, the GPO sales could be reduced. This could in turn affect the amount of monies redirected from net sales revenues to LPS to partially reduce the need for appropriated funds.

The LPS Information Technology Program (ITP) was established in the summer of 1987 with a charter to initiate agency electronic pilot projects for the depository program. However, no monies were appropriated by Congress for this program. The program focus instead has been on internal operations, such as automated shipping lists, a claims-processing system, and other microcomputer-based systems in support of LPS operations. Additional staff time has been spent gathering information on other agency electronic information programs and a few electronic projects such as the Census Disk. Over the next few years, under the status quo alternative, the role of ITP with respect to dissemination of electronic formats would continue to be limited.

The ability of LPS to accomplish its mission would be eroded to the degree that:

- electronically-formatted government information was unavailable to the public through the depository program;
- the agencies became even more dependent on NTIS rather than GPO/SupDocs as a dissemination mechanism for electronic products; and
- the agencies relied on contractors, interagency agreements, or private sector arrangements rather than GPO for electronic dissemination in general.

Although the number of selective depository institutions in the program would likely increase, several regional libraries (those libraries receiving and permanently maintaining all government documents) would likely drop membership in the depository program (as is happening currently). The increase in membership of selective depositories would be due to the minimum selection requirement that allows participating institutions to select only those government documents as appropriate for their patrons. The decline in the number of regional depositories would be attributed to the growing amount of government information that would need to be maintained permanently and the escalating costs of participation.

As GPO's role diminished, the role of the private sector in the provision of government information to the public would likely expand. An increasing percentage of information in electronic formats would be available only through private vendors. Depositories would have two choices: either pay vendors for government information not available through the depository program or directly from agencies, or not provide direct access to these materials for their patrons.[3] The costs to member depositories would increase and continue to rise as agencies moved to greater reliance upon electronic formats and private sector services. The costs to those depositories opting to provide access would continually rise as agencies moved to greater reliance upon electronic formats and private sector services. Also, depositories could incur increased costs for online searching and additional reference services to the extent that librarians and information specialists needed to check a greater number of sources for government information. Regionals could face additional costs to the extent that selective depository institutions were unable to provide specific information to patrons and as a result referred inquiries to the regional libraries.

Under the status quo alternative, public access to government information via depository libraries would likely be continually eroded and reduced. Equity of access would be adversely affected to the extent that patrons of depository institutions would have to pay for access to government information. Also, many of the agency electronic information products could be more difficult for patrons to locate. To the degree that depository library users were denied effective access to enhanced electronic versions of core governmental process information such as the *Congressional Record*, equity of access would be further reduced. As stated by Frantzich:

> The current hard copy version of the *Record* is particularly inflexible. While users generally want a full picture of a debate on a particular subject or the actions of a particular Member, these are scattered throughout the text and over a number of different documents. The ability to use new technology to "cut and paste" a tailored document would greatly increase the usability of the material in the *Record*.[4]

Under this alternative, overall government costs would likely increase since government at all levels (including Federal as well as State and local depository libraries) would not be receiving needed Federal information through the depository program and would have to maintain it through other more expensive means.

Under the status quo, with a greater number of agency information products available in electronic formats, GPO would be unable to comply fully with a legislative mandate of providing access to government information to the public through the depository library program.

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[3] Not all government information in electronic format would be available through private sector services, since some or many types of information would not be expected to produce monetary benefits for vendors. This information could be permanently lost to the public.

[4] Stephen Frantzich, "Public Access to Congressional Information in the Technological Age: Case Studies," Draft OTA contractor report, OTA, September 1987, pp. 50-51.

ALTERNATIVE II: ELECTRONIC DEPOSITORY LIBRARY PROGRAM

This alternative assumes that the existing DLP would be extended to include government information products in electronic formats as well as paper and microfiche. The program would be managed as it is now. In addition, this alternative assumes that GPO would serve as the disseminating agency for the depository program, and:

- each depository would select the type and number of formats; and
- OMB would issue a circular requiring agencies to comply with the depository program for all government information regardless of format (within current accepted guidelines for those materials that

are not confidential, administrative, or for internal use).

Under this alternative, the Superintendent of Documents would approve the inclusion of electronic products from Federal agencies for dissemination to depository institutions, in addition to paper and microfiche products. Under this alternative, it is likely that microfiche would still account for the bulk of products within the program. Dual format would probably continue for a minimum number of products, and fewer paper documents would be available to member institutions. LPS would be able to provide a choice of files in a variety of formats to members of the program, but these files would not always be available in all formats.

This alternative could have the following effects on the five major functions of LPS.

Acquisition of materials. Many of the current procedures for acquiring materials would continue. GPO would receive tapes, disks, or diskettes from the issuing agency, duplicate the new media in-house or via a contractor, or depositories would receive the materials directly from the agency or an agency contractor pursuant to an interagency agreement.

The information format would require individual decisions by the agencies and GPO to determine if GPO would operate in a centralized or decentralized mode. For example, a data file developed by or for an agency could be received by the depository via GPO, from the issuing agency directly, or from an agency contractor. This data tape could also be a "raw" data tape or one with "value-added" software included. Each mode of delivery to the depositories and each format has advantages and disadvantages to the program, the participating institutions, and the agencies. Thus, it could be more advantageous for libraries to work directly with the Bureau of the Census for certain data tapes. This could require additional infrastructure within agencies where the amount of electronically formatted information is significant. Another example would be CD-ROMs of the bound *Congressional Record* or of Bureau of the Census materials, where it might be more advantageous for GPO to ship the CD-ROMs directly to the depositories.

Classification of materials. The introduction of electronically formatted materials should not require any significant changes in current LPS classification procedures. The format type —paper, microfiche, CD-ROM disk, diskette, or online tape—would need to be noted as it is now. It would be necessary for the originating agencies to clearly define the source and nature of the electronic material so it can be properly classified and assigned a correct number.

Cataloging of materials. GPO employs AACR-2 (Anglo-American Cataloging Rules), the accepted standard for cataloging developed by the library community. The cataloging of new media is already an accepted practice in the library community. GPO's integration of new media into the depository program would require training of LPS cataloging staff and informational assistance to depository institutions to make library catalogers aware of the changes in format. GPO has developed *Cataloging Guidelines* that describe preferred routines for inputting records into the Online Computer Library Center (OCLC), use of AACR-2, serials procedures, and the like. GPO would be required to update these guidelines to include procedures for handling electronic formats.

Distribution of new materials. Overall, the current distribution procedures would remain with some modification for materials in an online format. Diskettes and CD-ROMS would present few, if any, new distribution problems to LPS. However, distribution of online data files could present a variety of problems, depending on whether the mode of operation was centralized or decentralized.

The addition of electronic formats might affect the selectivity of the depositories. Depository institutions are becoming increasingly selective in the number of and kind of government information products they receive. The inclusion of electronic products in the program would not change this trend, and might even increase selectivity. As with paper and microfiche, librarians would need to examine the government materials available in electronic format and explore the choices for their patrons. Whereas the initial cost of adding a document in microfiche is minimal (not counting the costs of storage and maintenance), the cost of equipment and software development for electronic formats could be higher, at least initially. With electronic formats, depositories would have new choices to make concerning the information needs of users.

Monitoring of member institutions and effectiveness of the program (as it relates to quality of service and access). The introduction of electronic files to the depository program and to GPO would require the development of additional GPO in-house expertise in information technologies. For example, GPO could contract for the mastering and production of CD-ROMs, produce CD-ROMs in-house (equipment permitting), or obtain the necessary number of CD-ROMs from the agencies. Regardless of the choice, an overall understanding of CD-ROM technology, production, and use would be needed to ensure an effective program.

The Information Technology Program (ITP) would need to be expanded. The new responsibilities of this office could include development of training programs for depository libraries that focus on equipment purchases, use of new electronic services, and awareness of electronic information products available from the government. **This training component would be critical to the success of this alternative, and would require increased funding.**

Overall, large institutions such as the Association of Research Libraries (ARL) members, academic institutions, and State libraries (which collectively account for over 50 per cent of the depositories) would be better prepared than smaller institutions to accept products in electronic format. These institutions already have much of the needed equipment and ongoing training programs for staff. Acceptance of electronic products probably would be slower at smaller institutions, primarily due to lack of necessary equipment, training, and an adequate financial base. The GAO Survey of Federal Information Users noted a growing technology base in depository institutions. If GPO were to provide electronically formatted materials, it is likely that more and more depositories would, over time, invest in needed equipment just as they did for microfiche.

Each depository institution would be in a different stage of development concerning the use of information technologies in support of depository library programs. For example, many university libraries already have CD-ROM equipment, whereas many smaller libraries do not. On the other hand, CD-ROM technology is inexpensive, very user-friendly, and requires minimal staff and user training. It does, though, require some training and knowledge in order to use different software packages effectively.

A determination would need to be made on what kind and level of support GPO should provide including, costs and other implications. For example, GPO could offer the depository libraries a series of comprehensive seminars on equipment and training, and/or form a team of information technology consultants similar to the current depository inspectors. This team would assist member institutions introduce electronic formats to the library staff and users.

Congress could consider a one-time equipment grant for depository library CD-ROM equipment but would need to address standardization issues. Depository participants and GPO are likely to be unable to regularly upgrade their CD-ROMs (for financial constraints alone), yet, at the same time, CD-ROM technologies are constantly changing (both hardware and software capabilities). One possible side effect of an equipment grant, if made, would be to encourage and accelerate standard-setting, since the government would be buying for up to 1,400 institutions.

Some reconsideration of retention policies would be necessary with the introduction of electronic files. These new policies would be applicable to regional depositories that are now required to retain all government materials permanently. There are over 50 regional institutions—a mix of public and private institutions and academic, public, and State libraries. Storage guidelines for new formats at these institutions, particularly for online files, would be an issue if the old requirements were retained. The two key issues that would need to be addressed would be the development of guidelines for online storage, and the development of guidelines regarding the costs to regionals for provision of online information to other institutions.

A new institutional structure for the depository program is evolving with the emergence of a set of "supra" regionals. The role of some regional depositories has developed into one of providing service support to other depositories, including staff time and equipment. Also, some regional institutions do not house all government materials received, but instead assume responsibility for these documents regardless of the location. This change has occurred due to increased cooperation among members, with "statewide" institutions expanding their participation. There are a number of advantages to this emerging structure:

- increased integration of government documents into library collections,
- greater resource sharing,
- spreading out the "burden" of the service support functions and costs, and
- improved flexibility of storage requirements.

This growth in cooperation and flexibility within the depository system is very important and should be beneficial as the amount of electronic information increases.[5]

Other impacts of Alternative II. Under Alternative II, there could be substantial savings in GPO production and distribution costs if more government information products were available in CD-ROM format and not produced in paper and microfiche (e.g., for certain Bureau of the Census materials). There could be additional costs incurred depending on the number of products distributed in an online format as this format can be more expensive. There would be some reduction in other current costs, such as for storage of paper and microfiche. For example, the cost of microfiche cabinets is very high—$3,000 per year, including maintenance and space considerations—and the reduction in the amount of microfiche could be a benefit to regional depository institutions.

All depository institutions that accept electronically formatted products might face additional costs from participating in the program. These costs would result from one or more of the following: 1) staff training, 2) equipment purchase (beyond that possibly provided by GPO, 3) costs of online searching, 4) local mounting and/ or downloading of government information, and 5) increased user support. The specific electronic format would affect the level of costs to the user, the library, or the government. For example, providing the *Congressional Record* retrospectively on a CD-ROM disk to all depository institutions (if mastered by GPO, replicated by a contractor, and distributed by the depository program), would likely impose some additional financial responsibilities on depositories and actually reduce costs to the government if provided in lieu of paper or microfiche. However, access to an agency online data file might involve additional costs to the depositories and/or the government when telecommunication costs are factored in.

Some regional depositories would face additional financial burdens, and some depositories might reconsider membership as the costs of resource-sharing increased. An increasing number of depositories not receiving certain electronic files might turn to the regional depository libraries for that information. If this occurred, it could be difficult for these regional libraries to maintain policies of free access to government information.

Under alternative II, overall access to government information would be expected to improve. But access would be enhanced only if depository libraries could accommodate and support electronic formats and develop resource-sharing procedures for those libraries that did not have the necessary technologies, funding, and training within a State or region.

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[5] Based on discussions with GPO, LPS staff, November 1987.

This alternative would increase the need for clarification of the roles and legal authorities of GPO, the depositories, and the agencies. Agencies presumably would be required to provide electronically formatted information to the depository program. Clear guidelines and possibly legislation would be necessary.

A Subalternative for Distributing Electronic Formats

A subalternative of Alternative II would make selected electronic products available to specified depositories not via GPO but via an agreement with private sector or not-for-profit services. The Public Printer has previously proposed a pilot project whereby private sector and not-for-profit services would disseminate selected government generated tapes to a subset of depository libraries at little or no cost to the government.[6] The private sector service would add value to five suggested databases: congressional bills, *Congressional Record*, *Federal Register*, *Code of Federal Regulations*, and the *Monthly Catalog of United States Government Publications*, in return for free receipt of the tapes. The private sector service would be required to accept all five tapes, because the total value of the five tapes would provide increased access for users and increased value to the vendor. The cost of the tapes would be debited to the depository program.

For this or similar proposals to be seriously considered, a number of issues would require clarification. For example:

- GPO would need to determine a level of public access to the electronic information that would be considered viable and appropriate. Would the combined value of the tapes minus the value-added costs provide a sufficient level of access to the public and sufficient incentive to the vendors?
- GPO would need to design criteria for selection of library participants. Telecommunications permit access to online information regardless of geographic location, so geographical concerns need not limit the libraries selected. The type of library, the facilities, equipment and training programs in the library, and the networking capabilities to other depositories are examples of criteria or factors that could be employed by GPO to select participants.
- GPO would need to specify the responsibility of participating libraries regarding the need to maintain paper and microfiche copies of these data files to guarantee access to government information, and for archival purposes.
- GPO would need some assurance (on behalf of all participants) of length and level of commitment by the vendor, and the vendor would require some assurance as to the commitment by GPO to the continuation of this program. For example, would this be a pilot project or a program that would seek congressional endorsement and financial support for, say, the next 3 years?
- For an option such as this to be successful, the vendor would likely already have considerable market share in one or several of the data files and within the library community.
- The value of the duplicated tapes and the "charge" against the depository program would need to be factored into the overall costs of the program.
- A determination of proprietary rights in the "value added" information and ensuing use by libraries would be necessary.
- Previous "barter" agreements between agencies and private sector services generally have been unsuccessful, and congressional committees with relevant jurisdiction generally have not supported projects of this nature. Congressional concerns would need to be alleviated prior to implementation of such a proposal.
- Arrangements concerning telecommunications charges and the like would need to be specified.

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[6] Letter from Ralph E. Kennickell, Jr., Public Printer, to Honorable Frank Annunzio, Chairman, Joint Committee on Printing, Dec. 10, 1987.

Under this subalternative, public access to government information would appear to increase. Electronic information would be available to the depositories at little or no immediate cost to participating institutions. Some insight would be gained concerning usage levels and the overall costs that would be associated with a larger electronic program. There would be minimal costs to government, at least at the outset.

There are also disadvantages associated with this subalternative. With the pilot project, only a selected number of libraries would participate and even those would have only a minimum level of access. It is unclear whether and under what conditions this subalternative could be extended to all depository libraries. The costs to the government while minimal with the pilot project would increase substantially over time as the number and types of files expanded. The question of proprietary rights in the value added by vendors would need to be addressed. Should or could these rights be waived, or should restrictions on public use of such value added information be accepted? Any restrictions could adversely affect the ability of libraries to share this information with other depositories and users. Overall, this subalternative would change the current relationships between the government and the depository libraries. Congress, GPO, and the libraries would need to consider carefully the implications of including new "partners" in the depository library program. Finally, barter-type arrangements such as this subalternative have not been successful in other agencies, for example, the Patent and Trademark Office (PTO) and the Securities and Exchange Commission (SEC). Another possibility would be for the government to simply pay the vendor for services rendered at a bulk discount rate.

ALTERNATIVE III: REORGANIZED ELECTRONIC DEPOSITORY SYSTEM

This alternative presents one of many possible future directions for the depository program once electronic pilots have commenced and user needs, usage patterns, and cost factors are more fully understood. This alternative seeks to describe a longer-term reorganized view of the LPS incorporating current and emerging technologies and reflecting the changing roles of libraries. The composition of participating libraries could be reviewed and reorganized, consistent with meeting user needs and optimizing use of resources. This alternative is based on the recent Association of Research Libraries (ARL) proposal for restructuring the depository program. This proposal has been put forth by the ARL Task Force on Government Information in Electronic Format for discussion purposes only. The ARL proposal defines a three-tiered system of libraries and library responsibilities. Three new levels of service would be designated: Basic, Intermediate, and Full:

- Basic Service—libraries with small government document collections and gateway access to electronic information located elsewhere. Basic service would be characterized by self-help, on-demand service, and high cost per transaction, but small fixed cost.
- Intermediate Service—libraries with a larger government document collection, including some electronic information and gateway access to other electronic information located elsewhere. Intermediate service would be characterized by some value-added information development and increased mediation between information resources and information users.
- Full Service—libraries with a complete government document collections and a full range of electronic information and gateways to other resources. Full service would be characterized by support from "related, locally available databases,"

> value-added services, development of software packages and similar "approaches which would change wholesale Government information into retail Government information," higher fixed costs, and lower per transaction costs.[7]

Under this alternative, LPS would continue to distribute government information to participating institutions. Electronic products from Federal agencies would be included in the depository program (and the *Monthly Catalog of United States Government Publications*) in addition to paper and microfiche products. Dual format would continue for a minimum number of products. Microfiche would probably continue to account for the bulk of materials in the program. LPS would be able to provide a choice of files in a number of formats, but these files would not always be available in all formats. The full-resource institutions would be assuming many new responsibilities, for example, local mounting of tape files. The new focus would be on the ability to access information as required from a host of available resources. With the reorganized structure LPS:

- would not require the same amount of printed or microfiche products from GPO;
- would need to expand the functions of the ITP;
- would determine with depository institutions the "core" collection for basic and intermediate services; and
- would work closely with depository members in developing criteria and infrastructure for the reorganized system.

Acquisition of Materials. Most of the current procedures for acquisition of materials would remain in effect. The discussion in Alternative II would apply to this alternative.

Classification of Materials. The previous discussion of Alternative II would apply to this reorganized electronic alternative. LPS and the intermediate-and full-service depositories could consider the value of devising a system whereby LPS would be notified of any value-added products, software products, or the like created by a member institution. LPS would then, in turn, notify other participants in the program (e.g., through Administrative Notes) that the products were available. The depository institutions could also rely on other networks and bulletin boards to convey this information.

Cataloging of Materials. The cataloging discussion found in the previous section would apply to this reorganized electronic option.

Distribution of New Materials. In addition to the distribution mechanisms discussed in the previous section, a core collection of materials for basic and intermediate levels of service would need to be developed by LPS in concert with the depository institutions. Distribution systems or new resource-sharing procedures between basic, intermediate, and full service libraries would need to be developed by participating institutions and the LPS. These procedures would include a description of the responsibilities of each service level, financial obligations, interlibrary loan procedures, and the like. ITP could be responsible for assisting intermediate-and full-service institutions with new technological applications, and providing current information on activities in Federal agencies, such as the development of new electronic information products and applications.

Monitoring of member institutions and effectiveness of the program (as it relates to quality of service and access). Most of the new tasks noted in the previous discussion of Alternative II would apply here as well—the expansion of ITP to assist libraries in choice of formats, technological applications, and liaison with other Federal agencies; new retention policies for electronic formats; and the possible provision of CD-ROM equipment. Overall, policies for bibliographic searching, cooperative acquisition, interlibrary loan, document delivery services, reciprocal borrowing privileges, referral and reference services, and the storage and preservation of government materials would need to be modified or created.

The establishment of a new infrastructure for the depository program would probably require changes in the monitoring responsibilities of LPS. Depository members and GPO together would need to define the goals and objectives of the new system, define the responsibilities of each level of service, and define the responsibilities of GPO and an overall framework for monitoring performance of the depository program. The current system employed in a number of regions, whereby regional depositories have assumed some responsibilities for the level of service in their region or State, might be applicable in the new system. In this instance, full service libraries would with intermediate libraries assist new libraries wishing to join the depository system and would regularly evaluate the services needed and those already provided for the region.

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[7] Association of Research Libraries, op. cit., footnote 1, p. 22.

The depository institutions would need to consider carefully which level of service under the reorganized system would best serve their organization and patrons. There is a wide variance in technological sophistication among the libraries in the current depository system. The same variance would be evident in a reorganized system, and many libraries would not be capable of providing "gateway" services without guidance and support from affiliated depository members. The reorganized structure would likely streamline the current program and permit the development of a network or system of depository institutions, recognizing that there is a need for different levels of service.

Other impacts of Alternative III. It is difficult to determine if there would be savings to government under this alternative, without detailed cost-benefit studies. Reducing distribution of paper and microfiche would save money. However, there would be transition costs as well as new equipment and training costs (e.g. resulting in the shifting of funds from distribution functions to ITP within LPS).

Access to government information would be improved under this alternative. A reorganized electronic program would: 1) facilitate access to print-based materials and electronic information, 2) expand and improve access to a host of online information services and products, and 3) encourage a new level of sophisticated manipulation of information electronically (government and nongovernment information). The reorganized structure would permit an information network to develop among depositories, allowing for increased efficiency and access to information resources on a national, State, and local scale.

This alternative would increase the need for clarification of the roles and legal authorities of GPO, the depositories, and the agencies. Agencies presumably would be required to provide electronically formatted information to the depository program. Clear guidelines and possibly legislation would be necessary.

DISSEMINATING ELECTRONIC INFORMATION PRODUCTS—TWO CASE STUDIES

The previous sections examined three possible alternatives for the depository library program: maintenance of the status quo, an electronic depository library program, and a reorganized electronic depository library system. This section will examine two formats (online and CD-ROM) and delivery mechanisms for specific government data files as test projects for disseminating electronic formats through the DLP. The data files described are the *Congressional Record* in CD-ROM format for the bound, cumulated file, and the *Federal Register* online. These files were selected for several reasons. First, the *Congressional Record* and the *Federal Register* represent core or process government information. Second, these files: have been identified by depository librarians as useful and/or desirable in electronic format; are extremely popular with high or regular usage; and are files found in most depositories. Third, providing these files in electronic formats clearly improves and enhances public access, and in some cases timeliness, compared to paper and microfiche formats. The bound or final *Congressional Record* in CD-ROM format and the *Federal Register* online could be made available to depositories as described in Alternatives II or III. Finally, the JCP recently announced that the bound *Record* will be available on CD-ROM through GPO.

Congressional Record on CD-ROM

In the 1983 Ad Hoc Committee on Depository Library Access to Federal Automated Databases survey of depository institutions, depository librarians identified the *Congressional Record* as a key data file which, if available in electronic format, would enhance access by patrons to government information. The *Congressional Record* is received by most depositories, is currently available in paper or microfiche (dual format) from GPO, and is available online for a fee through several commercial vendors.

The *Congressional Record* contains the daily record of House and Senate floor proceedings as well as schedules of other congressional activities and actions. A new *Record* is produced nightly and is available to the public the following morning. It has been stated that, "a distinguishing feature of the *Record* is its timeliness."[8] GPO receives scheduling information, prepared remarks and inserts from Members, floor debate transcripts, bill texts, and other documents and melds this material into a 200-to 300-page document every night that Congress is in session.

The material is accepted by GPO in numerous formats (electronic, printed, and handwritten) which are then entered in the database by GPO staff. This new electronic version is used to produce the printing plates for the printing of the *Congressional Record* in hard copy.[9] The electronic database in the form of magnetic computer tapes is corrected and then made available for purchase through the Superintendent of Documents within 24 to 72 hours after the printing of each *Record*. A number of vendors acquire these tapes from the GPO, add value to the existing version, and sell this enhanced information to clients. A yearly subscription to the *Congressional* Record tape service costs $29,300, and each tape can be purchased for $175. Microfiche copies of the *Record* are produced by a GPO contractor and are then distributed by GPO. These microfiche copies are not available as quickly as either the paper or electronic formats.

The *Congressional Record* is recorrected and new printing plates are created to produce the bound, permanent copy or final edition of the *Congressional Record*. The bound *Record* is a number of years behind. The most recent bound volumes published cover 1982 (volume 128) and 1985 (volume 131), with current efforts focused on 1983, 1984, and 1986. The most current index available is for 1980. The 1981 index is in production and expected in 1988; the 1982 index is scheduled for completion in late 1988. The cumulated, final, bound *Congressional Record* represents the only corrected edition of the *Record* and is important for archival, historical, and sometimes legal purposes. (For more information on the issues relating to the *Record*, see ch. 8.)

Bound *Congressional Record* on CD-ROM

There are a number of possible options for mastering and replicating a CD-ROM disk of the bound *Record*; for example, by GPO, by a commercial vendor, or by a combination of the two. Several new internal production steps will be necessary to produce a disk. Once complete, the yearly cumulative *Congressional Record* on CD-ROM, produced either by GPO or a contractor, could then be shipped to the depositories through normal distribution channels. The disk could also be available through the Superintendent of Documents for a fee (the usual cost plus 50 per cent).

The corrected daily *Record* tapes produced by the GPO Office of Information Resources Management will be the digitized data used for the creation of the CD-ROM. GPO management is currently considering the lease of a CD Publisher system that is capable of reconfiguring (reindexing) a file structure and preparing the file for one or more disks. This file would then be ready for a contractor to master and replicate CD-ROMs for GPO distribution to the depository libraries and/or sale through the Superintendent of Documents.[10] GPO management has determined that GPO staff will not develop the needed retrieval software itself, but will purchase the software from a vendor. Producing the software on CD-ROM *may* eliminate the need for a separate index to the *Record* because of the search and retrieval capabilities inherent in CD-ROM software. On the other hand, it is also argued that there may be the need for both the *Congressional Record* Index and the CD-ROM search and retrieval software because the index provides additional reference points and "human judgment" not found in the software.

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[8] Frantzich, op. cit., footnote 4.

[9] Due to time constraints of the printing process, errors in the electronic tapes are not corrected immediately. For more information see Frantzich, op. cit., footnote 4, p. 35.

The average amount of data in the *Record* per year is: 37,594 pages representing over 500 million bytes of information (for 1985 as a sample year). These figures do not include an index to the bound version. GPO is considering many possibilities. Two under consideration are: one year, one volume of the bound version of the *Record*, without the index, plus required/necessary software on one CD-ROM; and one year of the *Record* on one CD-ROM, plus a floppy disk that would contain the software for accessing and manipulating the data residing on the CD-ROM. Because GPO has not developed such a disk before, staff are uncertain as to the amount of data that can fit on the disk and what constitutes the "best" approach.

Certain crosscutting criteria can be applied to each data file and delivery mode to describe and present the opportunities and drawbacks of each format option. These criteria are:

- data requirements—including completeness, size, and use of data, timeliness, etc.;
- delivery mode—including format, equipment needs, training needs, etc.; and
- costs—including startup, equipment, staff, operational needs, etc.[11]

Data requirements. Under the current guidelines, GPO only offers to depositories the microfiche format with a paper index of the bound final *Congressional Record*. If the CD-ROM bound *Record* were available, libraries could choose among the two formats (microfiche or CD-ROM) for a limited amount of transition time. This transition time would provide data to determine user preferences regarding the format of the bound or final *Record*. (A limited number of printed copies would be available for purchase through the Superintendent of Documents.) The bound *Congressional Record* serves as an important historical, archival, and legal tool. Member institutions would need to determine their institutions' needs regarding access (printed or electronic) and transition time between different formats if switching from paper and microfiche to CD-ROM or microfiche to CD-ROM. Many libraries may be in the position of housing paper, microfiche, and electronic versions of the *Record* for archival purposes.[12] Many of the same transition issues addressed in the late 1970s and 1980s, as libraries incorporated microfiche into their collections, would apply here.

There is no agreement on the longevity of optical disks, with estimates ranging from as little as 10 years to as long as 100 years. Also, although CD-ROMs may endure for up to several decades or longer, the equipment used to "read" these products may quickly become outdated. Format longevity is important for archival purposes because one goal of some depositories is to provide a continuous and complete record of government information. The importance of maintaining a usable and complete *Record* file reflects several needs—

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[10] At this time, GPO does not intend to master and replicate CD-ROM products. GPO believes that it would not be cost-effective for the agency to invest in such equipment or necessary manpower at this time. If the need for and use of CD-ROM products by the Federal Government increased radically and requires substantial production capabilities, then GPO would reconsider its position.

[11] These criteria are based in part on questions proposed by the ARL Task Force on Government Information in Electronic Format for use in evaluating pilot projects; Report No. 1, App. 1, Oct. 30, 1986, Draft No. 1.

[12] GPO could begin production of CD-ROM formats beginning with the 1983 bound *Record*. However, GPO would be unable at this time to retrospectively convert earlier (pre-1983) *Record* tapes to CD-ROM products.

historical research, research on a political position, and, increasingly, determination of legislative intent by the courts, agencies, lawyers, and others.

Timeliness is not a critical issue for the bound *Record*, though use of the CD-ROM format probably would reduce the current backlog. As with the replication of microfiche, GPO would rely on private sector contractors to master and replicate the disks. The schedules and reliability of the firms chosen as well as GPO contract specifications would, in many respects, determine the turnaround time from GPO to the depositories.

The availability of the bound *Record* in a CD-ROM format would enhance and improve access by users to those files. The number of users simultaneously using *Congressional Record* information would not necessarily increase, but ease of access to the file would increase dramatically. This would be particularly true when compared to the microfiche format. In addition, by its very nature, indexing would be built into the disk file, whereas with microfiche there is a separate index (still maintained in paper for congressional and depository use), and searching is more cumbersome and time-consuming. The CD-ROM format would include print-on-demand capabilities similar to those in use today for microfiche reader/printers. It has been noted that:

> A major limitation of using the *Record* in its current form is the limited indexing and the difficulty of finding materials. Whereas, the ability to create new subsets of data makes an electronic database very powerful and much more valuable than a paper catalog. Searches of the database become easier, faster, cheaper, and more thorough.[13]

In general, the bound *Record* is not one of the most heavily used items in a depository, but it is one that 1,305 of the 1,393 libraries maintain and one that is used by patrons. It is expected that improved indexing and easier retrieval of information would increase the use of the *Record*.

Delivery and costs. There would be few, if any, new requirements or equipment needs for LPS to deliver this information in CD-ROM to the depositories. As noted in Table 7-1 the estimated per-library cost for provision of the bound *Congressional Record* is $632.83 for paper format; $33.74 for a hard copy of the index of the *Record*; $83.62 for a microfiche copy; and $10.05 for a CD-ROM plus floppy disk (one of two possibilities under investigation). If GPO used commercial access software with the disk, there might be an additional software license fee, although it would likely be minimal. According to GPO, the overall cost of producing the microfiche master of the bound *Record* is $5,047.50, and the estimated production cost of the CD-ROM master for the bound *Record* is $1,700. GPO would not require supplemental funding to produce the CD-ROM for the bound *Record*, if this were the only format produced.

However, member depository libraries would need to assess their CD-ROM information access and equipment needs. The GAO Survey of Federal Information Users found that over 40 per cent of those surveyed have a CD-ROM player or access to one. Those libraries without CD-ROM players would need to invest about $600-$700 per player. The GAO survey also found that 283 of 451 depository libraries have (or have access to) a microcomputer without a modem, and 337 of the 451 have a micro-

Table 7-1.—Estimated Costs Per Library Per Year for Distribution of the Bound *Congressional Record* to Depository Libraries, Various Formats

	Paper Copies	Paper Index	Microfiche Copies	CD-ROM Copies
Printing Cost	$569.70	$30.30	—	—
Production Costs	—	—	$28.27	—
Duplication Costs				
CD-ROM	—	—	—	$3.00
Floppy Disk	—	—	—	$5.00
Postage	$55.30	$3.13	$.85	$1.49
Handling	$7.83	$.31	$54.50	$.06
Documentation	—	—	—	$.50
Total	$632.83	$33.74	$83.62	$10.05

SOURCE: U.S. Government Printing Office, 1987.

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[13] Frantzich, op. cit., footnote 4, p. 42 and, Stephen Frantzich, "Public Access to Congressional Information: The Potential and Pitfalls of Technology Enhanced Access," OTA contractor report, January 1987, p. 17.

computer with a modem for online access (many libraries have more than one microcomputer). Those libraries not having a microcomputer, or not having adequate access if the equipment is located elsewhere, would need to invest in a microcomputer as well, at a cost of about $1,200 to $1,400. If CD-ROM becomes a major format for depository distribution, many libraries may wish to invest in a complete CD-ROM system (player, microcomputer, and printer, at a total cost about $2,500-$3,000 per system) for dedicated use.

GPO/LPS training needs would be rather minimal. The LPS training role could be directed toward assisting member libraries choose equipment, providing or developing additional software applications, and arranging training seminars for participating library staff.

Depository library training requirements would be greater. Libraries would need to provide both hands-on training sessions for staff and at least minimal assistance to users. The amount of training and assistance required would depend, in part, on the software package provided or developed by GPO and its ease of use. Libraries that have provided some user CD-ROM training and instruction note improvements in user capabilities and search-strategy success.[14]

An important consideration with the introduction of any service is to factor in, as well as possible, the life cycle costs. The shift to a CD-ROM format for the bound *Record* could result in a three-format collection for many institutions (for archival and preservation purposes): 1) maintenance of paper format for current information, 2) microfiche for the retrospective collection, and 3) CD-ROM for the bound *Record*. The combination of formats would require the use of different equipment and possible upgrading of equipment (particularly for CD-ROM players), all with associated purchase, lease, and/or maintenance costs. However, this equipment would be used for numerous tasks and many information products, not just the *Record*.

In summary, there appear to be numerous advantages to using the CD-ROM format for the bound *Congressional Record*:

- the large textual database lends itself to the CD-ROM format;
- the information is not current data and, therefore, does not require regular updating;
- the efficiency and ease of access to the information would improve with this format, compared to either paper or microfiche products;
- library shelving needs would be reduced;
- there could be substantial cost savings for the GPO/Library Programs Service, depending on the format options; and
- for some libraries, the ability to combine the historical data on disk and current data online would present exciting new access possibilities and potential.

The disadvantages of adopting the CD-ROM format would be:

- the need for some libraries to purchase one or more pieces of equipment;
- the need to provide physical space for CD-ROM work stations for microcomputers, printers, and CD-ROM players; and
- finally, the need for some or many libraries to maintain collections of the *Record* in paper, microfiche, and CD-ROM formats.

Federal Register Online

The *Federal Register* is one of the core or process documents included in the collections of most depository institutions. The *Federal Register* is a dual format item (available in microfiche or paper from the GPO), and is available online (all or parts thereof) through several commercial services for a fee. The *Code of Federal Regulations* (CFR) is also available in CD-ROM format from VLS OPTEXT. VLS plans to offer a combination *CFR* and *Federal Register* on disk quarterly with "seamless" access to an online *Federal Register* file.

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[14] For more information see K.J. Pearce, "CD-ROM: Caveat Emptor, *Library Journal*, vol. 113, No. 2, Feb. 1, 1988, pp. 37-38; and Linda Stewart and Jan Olsen, "Compact Disk Databases: Are They Good For Users?, *Online*, vol. 12, No. 3, May 1988, pp. 48-52.

The *Federal Register* is a daily publication of the government that documents executive branch regulations (proposed and final), presidential directives, meetings, and policies (proposed and final). The classes of documents found in the *Register* are grouped under four headings or categories:

1. the President's section consisting of executive orders, proclamations, and other presidential documents;
2. rules and regulations, which include the administrative actions pursuant to statutory law;
3. proposed rules, that provide an avenue for notification of new rulemaking and for interested parties to comment on draft rules; and
4. notices, which include miscellaneous agency material, advisory activities and opinions, meetings, and the like.[15]

Like the *Congressional Record*, the *Federal Register* is produced daily by GPO, and an electronic database is created by GPO for use in the printing process. Also, like the *Record*, the hard copy of the *Federal Register* takes precedence over both electronic and microfiche versions. The microfiche version is replicated (by a GPO contractor) and distributed 24 hours following the printing, and the corrected electronic tapes are available up to 72 hours following the hard copy release. Final corrections are made by GPO in the electronic database during a lull in the printing process. These data tapes, once corrected, can be purchased on a yearly subscription basis for $37,500, or on a daily basis for $175 per tape from the Superintendent of Documents. The daily *Register* contains an index, and a cumulated index is produced monthly. Indexing of the *Register* is automated. The average number of pages per year in the *Federal Register* is 52,000, representing 416 million bytes of information, including the GPO printing codes.

Frantzich has noted that:

> It is unreasonable to expect individuals and organizations to comply with the rules and regulations of government without timely access to the relevant details. A prime purpose of the *Federal Register* is to solicit comments and inform the interested public about meetings on proposed regulations.[16]

The *Federal Register* is regularly cited by depository librarians as a key document that is needed on an up-to-date basis; 1,040 libraries receive paper copies of the *Register* and 363 receive microfiche copies, both via LPS. In the GAO survey, depository librarians identified the *Federal Register* online as one of the most useful electronic services that could be provided. The *Federal Register* has been described as one item received by depositories that can "never arrive soon enough." If not received in paper format, it is clearly less useful in microfiche due to the time lag and the inherent limitations of the microfiche format.

LPS requests that depository members retain at least the current and previous year's editions of the *Federal Register* on file. Member libraries also retain the current year of the *Code of Federal Regulations* (except for Title 3). Much of the pertinent material printed in the daily *Register* is eventually included in the *Code of Federal Regulations*. Some regional depository libraries keep retrospective microfiche collections of the *Federal Register*. Use of these back files has been described as minimal due, in part, to the difficulty in using the microfiche format.

Federal Register Online Delivery

If the *Federal Register* were to be provided online to depository libraries, there are several possible delivery options:

Option 1: Centralized delivery. Depositories would have direct access to the *Federal Register* data file maintained by GPO, with GPO providing minimal value-added enhancements to the basic data and with libraries using commercial dial-up telecommunication lines;[17]

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[15] Frantzich, "Public Access to Executive Agency Information in the Technological Age: Case Studies, OTA contractor report, February 1988, p. 8.

[16] Frantzich, Ibid.

Option 2: Decentralized delivery. GPO would duplicate and provide *Federal Register* computer tapes to a select number of depositories; these depositories would, in turn, locally mount the data and make the information available online to participating libraries in a designated region; and

Option 3: Subscription basis. Depository libraries would access the *Federal Register* data file via a commercial or not-for-profit vendor with a subscription subsidy (full or partial) provided by GPO.

Each of these options will be considered in terms of the same criteria applied in the previous discussion of the *Record* on CD-ROM: data requirements, delivery, and costs. The bulk of the information presented in the discussion of centralized delivery applies to the discussions of decentralized and subscription delivery. Choice of these three delivery options for discussion does not preclude other possible options. It is important to note that decisions concerning the *Federal Register* are made by the Office of the Federal Register (OFR). Decisions relating to format and dissemination are determined by the Administrative Committee of the *Federal Register*, whose members are the Archivist, Public Printer, a representative of the Department of Justice, and the Director of the Federal Register.

Centralized Delivery

The daily *Federal Register* computer tapes, plus minimal search and retrieval software developed by GPO's Office of Information Resources Management, would be the basic service provided by GPO to the depositories. The GPO would provide the data via telecommunication facilities online to depositories. The information provided to the depositories would be the same as that found in the paper and microfiche formats, except for the electronic format indexing aids, and would likely be available within hours of the printed *Register*.[18] GPO would need to determine how much data to maintain online—for example, the past year or two of the *Register*. Users would be required to use paper or microfiche copies of the *Register* for certain dated materials—for example, those more than 6 months or a year old—instead of relying on the online file.

Data requirements. Online access to the *Federal Register* would greatly improve and enhance access to and timeliness of the information for patrons. Receipt of the *Register* in a timely fashion is one requirement of its use. Unlike direct access with CD-ROM technology, online access could require a trained information specialist. Although there are user-friendly software packages available, the telecommunication costs associated with online access can be high, and these costs could be reduced if a trained librarian performed the search.

Although access to the information in the *Federal Register* file would be improved, unless the libraries have high speed modems, users' searches would likely be limited and the information would be downloaded and printed offline. This adds an additional step to accessing the information.

Libraries choosing to access the *Federal Register* online via GPO would still need to retain some archival copies of the *Federal Register* for retrospective information. For example, these libraries could elect to maintain microfiche copies of the *Federal Register* for archival purposes and access the *Federal Register* online from GPO for current information.

It is difficult to estimate the average usage of the *Federal Register* file per library, or even by type of library, due to the diversity and mix of the depository members. While lacking concrete data, several general observations can be made. First, for many libraries, the *Register* is used most heavily when first received, and then usage drops off. Second, for those libraries choosing to access the GPO database, with microfiche as the format maintained for archival purposes, there would be greater reliance on the online system due to ease of access and improvement in timeliness. Third, without a certain "cap" placed on usage by depositories, GPO could face ever increasing telecommunication costs. The recent experience of the PTO with a similar online service is illustrative (see Table 7-3 and discussion below).

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[17] Minimal value-added enhancements would mean adding sufficient search and retrieval capabilities to the database to permit access and use. Anything beyond this level could be left to the private sector to develop and market.

[18] GPO is striving to improve the turn-around time for correcting the tapes for the *Record* and *Register*.

Fourth, if an overall online usage level were set, guidelines would be necessary for allocating access throughout the month so that the allocation would not be used up in the first few days. Law school libraries are heavy users of the *Register*, as are large urban public libraries. Other depository members have stated that use of an online *Federal Register* would be minimal, perhaps as little as once every other month. Usage of the online service would be quite disparate among the depository library members, with some employing the service less than once a month and some requiring daily use. Fifth, the enhanced access and capabilities of such an online file could increase usage by patrons, which would, in turn, increase the value of the file to users.

Data Delivery. A microcomputer, modem, and printer would be the necessary components for a library electing to access the GPO database. This would be no different than current access to online services such as DIALOG, BRS, and others.

Costs. The *Federal Register* is funded through the publishing agencies, not the depository library program. As seen in Table 7-2, the cost of printing, postage, and handling per year, per library subscription to the *Federal Register*, is $339.67. The cost of the microfiche master, again paid by the publishing agencies, is $7,238, and microfiche copies are $103.12. There are no comparable figures for online costs for a GPO *Register* file. However, the online commercial service of Federal Register Abstracts from Capitol Services Inc., available through DIALOG, ITT, and SDC, costs $75 per hour, plus $.20 per full record printed offline.

Table 7-2.—Estimated Costs Per Library Per Year for Distribution of the *Federal Register*, by Format

	Paper Copies with Index, CFR Sections[a]	Paper Index Only	CFR Sections Only	Microfiche Copies[b]
Printing Cost	$209.01	$5.66	$8.45	—
Production Costs	—	—	—	$23.74
Postage	$61.16	$3.06	$3.06	$1.21
Handling	$69.50	$3.00	$3.00	$78.17
Total	$339.67	$11.72	$14.51	$103.12

[a] Includes relevant sections of the Code of Federal Regulations (CFR).
[b] Includes *Federal Register*, Index, and relevant sections of the CFR.

Source: U.S. Government Printing Office, 1988.

The recent experience with the Classification and Search Support Information System (CASSIS) at PTO is useful in evaluating the delivery of an online information service to libraries, although the information is different and the number of libraries within the Patent Depository System is much smaller. The provision of online patent information to the patent depository libraries direct from PTO resulted in spiraling costs of over one-half million dollars in 1987 at over $120 per hour (see Table 7-3) and a partial termination of the program. PTO has, instead, offered a CD-ROM disk with the same information to participating patent depository libraries. The CASSIS system does not require constant or timely updating; therefore, a CD-ROM is an appropriate technology for this information. Overall, the cost to GPO and the government or to the libraries in delivering an online file could be high, depending on who pays the computer and telecommunication charges and how the development costs are allocated and recovered.

Table 7-3.—Queries and Cost Data for Online Patent Information, 1987

Total Queries:	151,808
Total Connect Time:	4,315.4 hours
Total Cost:	$552,066
Average Cost per Inquiry	$3.64
Average Cost per Connect Hour	$128 including telecommunication costs of about $20 per hour

SOURCE: Patent and Trademark Office, 1987.

If GPO were to provide online access to a *Federal Register* database, it would be important to evaluate necessary capacity to serve a broader constituency. GPO is planning an upgrade of their computer facilities. This upgrade is designed for several reasons, one of which is to add capacity to accommodate access by congressional users to an online *Congressional Record* database. (See ch. 8 for more information.) If the *Federal Register* were available to depositories online, GPO would need to examine whether this system could accommodate both congressional and depository access and for more than one data file. The introduction of such a service would place GPO in the position of an information provider for another agency's data file. Presumably, either GPO would be providing this online service for the OFR on a reimbursable basis or GPO would receive appropriations to provide such a service.

There would be additional costs to some depositories if this service and format were added. These costs might include training costs associated with learning to use the data file, and equipment costs for those libraries without an available microcomputer and modem. The GAO user survey found that 283 of 451 depositories surveyed have access to a microcomputer without a modem and 337 have access to a microcomputer with a modem for online access. Thus, for some libraries, online access to the *Federal Register* would require the purchase of a modem ($200-$300) and, for some, a microcomputer.

Another variation on this option would be to provide online access to a *Federal Register* database modeled after the National Library of Medicine (NLM) system. The NLM access policy provides that "users share in the costs of access to online services and tapes," and that "appropriations . . . bear the cost of building the database, the creation cost."[19] Paper or microfiche products would be required in concert with this electronic option to guarantee "free" access by those who choose to use the traditional formats. Users would be expected to pay a minimal fee for access to government information in an additional, but optional, format, and users would be given a choice. The average hourly search cost for the NLM databases is between $17 and $22. This is significantly less than the commercial or PTO costs and merits further consideration, especially given the responses to the GAO Federal Information User Survey. Most depository library respondents expressed willingness to pay at least a minimal fee ($1-$24 per hour) for online access to the *Register* data.

Decentralized Delivery

Here, GPO would duplicate magnetic computer tapes of the *Register* for those institutions participating in a distributed regional access program. Daily tapes would be duplicated (in-house or via duplication services) and shipped by overnight mail to depositories for mounting on local computer facilities (or could be downloaded directly by electronic data transfer). These libraries would be responsible for providing at least a minimal, agreed-upon level of service/access to depositories within their region. Libraries, not GPO, would be responsible for developing usage policies and resource-sharing principles. In consultation with depository libraries, GPO would determine the needed regional distribution and number of libraries required for such a plan. Delivery of information between participating institutions would require interconnections with local, State, and regional networks.

Data requirements. The computer tapes provided to the depositories would consist of daily *Federal Register* data. Minimal retrieval capabilities would be provided by GPO with licensed software, or the participating institutions could choose to license another software product with comparable or enhanced capabilities to meet local requirements. Storage requirements for the local institutions would likely require that one year's data be kept online. The libraries could choose to mount the data in one of two ways: one file with full text data online; or two files with the indexing aids on one for the initial search, and the full text file on the second for follow-on search, if necessary. Inquiries for information more than 6 months to 1 year old (or whatever period chosen) could be referred to paper, microfiche, or CD-ROM collections of archival data. Most of the discussion found in option 1 (centralized delivery) pertains to this option as well.

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[19] NLM, Pricing Policy and Medlars Fees, May 1985.

As with option 1, usage of this data file would likely increase at certain institutions, with little change at others. There would be enhanced access to information in the daily *Register*, and the value of the information to the user would increase due to improved timeliness and accessibility. The number of patrons using the online system might increase because the local costs per inquiry would be reduced compared to option 1, and user-friendly software could assist local users. The number of users of an online system would likely increase, if microfiche were the only other format available. Use of the library's "full" collection of government documents would likely increase as a result of the *Register* being online and the integration of government information with the rest of the library's collection.

Access to information found in the online *Federal Register* would be improved due to the electronic format. However, as in option 1, unless the library has a high speed modem and can download quickly, the library would likely limit long searches and request that printing of the file be done offline. In this case, with the file as a local resource, many of the same time constraints would apply.

Archival copies of the *Register* would likely not be in tape format due to the size of the database and ensuing storage requirements. In concert with other local institutions, archival plans could be formulated, possibly permitting a sharing of archiving resources, including consideration of CD-ROM products.

Data delivery. For libraries participating as "hosts" in the regional access program, affiliation with a computer center, either resident within the library or within a university or local government community, would be required. It is likely that the needed computer facilities, for example, mainframe computers, would already be in place in the host institution, so that the addition of one more database would be minimal. Of the 451 depository institutions responding to the GAO Survey of Federal Information Users, 149 have access to a mainframe computer. To appreciate the cost undertaken by a library to support such an effort, the up-front cost of a database management system could be as much as $300,000, plus approximately $300,000 per year to maintain and run the software package. This level of a database management system could accommodate many online services and up to 50 concurrent individual searches employing complex searching (boolean) techniques. The cost of adding additional files to such a system could range from several to tens of thousands of dollars.

Equipment needs within a region would be as they are now—varied and uneven. Decisions concerning access within a region would be required to determine hardware and software necessary for connectivity, for example, dedicated phone lines from depositories to the "host" library. A minimum level of service, as set forth by the GPO, would be required of all participants so that the "host" institution, in concert with other local, regional, State, and national networks, could accommodate depositories. Additional services and responsibilities would be determined by the host institution.

There would be training needs at the host institution as well as those institutions electing to access the online file. This would entail training on use of the file and, in some cases, training on use of equipment for access to files. Database management packages available are "user friendly," and these packages permit users to perform searches without assistance. Additional staff would be required for maintenance of the file and for training programs.

Costs. There would be minimal additional costs to GPO under this option and increased costs for the host depository institutions. As shown in Table 7-4, it would cost GPO a maximum of $62.70 to prepare and ship a tape to a depository, and this estimate may be quite high. A more realistic cost is about $30 per tape if tapes are recycled and some of the loading

Table 7-4.—Estimated Reproduction and Distribution Costs, Per Magnetic Tape

Initial loading of the tape	$7.00[a]
Computer duplication	$23.25[a]
Packaging and labelling	$10.00[a]
Cost of tape	$14.75[b]
Postage	$7.70
Total	$62.70

[a] Does not create new expenses for GPO if the tasks can be performed with existing personnel and no overtime is required.
[b] This expense can be avoided if the vendor/user is required to return the tape to GPO for reuse.

SOURCE: U.S. Government Printing Office, 1987.

and duplication costs are provided in the course of normal GPO operations.

The host depository costs would likely entail initial expenses for mounting and yearly maintenance and access costs. With computer facilities and storage capacity already in place, the other new costs would be for additional telecommunication and administrative support. The costs noted previously for a database management package and yearly maintenance would be the approximate investment necessary per institution if the facilities were not already in place. Once in place, the costs of including another database would be incremental. Local usage costs would be less, given the reduced telecommunication costs. The uncertainty involves comparing host institution costs for access charges to information resident elsewhere, and the costs of mounting locally and permitting access by other depository institutions. Other local costs would likely reflect increased use of the library collection and resources, including costs associated with expanded interlibrary loan and additional equipment, and space requirements for work stations.

The costs to the host library in providing this service to other "local" institutions would require careful evaluation by GPO and by the host library to ensure that the benefits of mounting the file are not outweighed by greater than anticipated usage, additional staff and training costs, and equipment needs. Participation would likely require careful coordination with and support from local, State, regional, and national networks.

Subscription Basis

Here, GPO would, on a subscription basis, provide online *Federal Register* information to depositories. GPO would contract with a vendor or not-for-profit institution for a minimum period of time (e.g., 3 years) to provide online *Federal Register* data to all depositories. GPO would provide a full or partial subsidy to the depositories for use of this system.

GPO would, through a solicitation process, select a vendor to provide depository members with access to an online data file of the *Federal Register* for a minimum of 3 years to provide some continuity. The vendor or not-for-profit service would provide search and retrieval capabilities within the file comparable to that described in options 1 and 2 (centralized and decentralized GPO delivery). The information provided to the depositories would be the same as that found in the paper and microfiche format, except for electronic format indexing aids, and would likely be available within hours of the printed *Federal Register*. One year of *Federal Register* data could be included within the data file. Much of the discussion found in option 1 applies to option 3. And as with option 2, reliance on local, State and regional networks would be important to the success of this option.

Data requirements. As with options 1 and 2, users would have enhanced access to *Register* data in electronic format. The timeliness of the data would also increase the benefit to users. Under this option, there could be some difference between the types of use possible. Once the data file was mounted at an institution (as in option 2), there could be unlimited downloading or manipulation of that file by users. This may not be the case with option 3 due to telecommunication costs, possible restrictions placed on this file by the vendor, and the type of search and retrieval software employed.

Concerns for archiving the data would be the same as with options 1 and 2. Archival copies would need to be retained in some format. A combination of online and CD-ROM might provide the optimal mix of access and archival requirements. The preservation needs of the library would not be the same as those of the vendor. Consequently, maintenance by libraries of an alternative format would be required. As with options 1 and 2, local resource-sharing policies could be considered.

The extent of usage of this file would be similar to one provided by GPO, with the improved timeliness and ease of access increasing the number of users. Also, these improvements would increase the value of the file to users.

Data delivery. As with option 1, there would be few new requirements beyond a microcomputer and modem for those libraries electing this format. Accessing this data file would be like accessing any other online information service. Depending on the vendor selected, there could be a need for depository library staff training. The telecommunication costs would likely drive the need for a trained information specialist to perform searches for patrons in order to contain search costs, even if user-friendly software were used.

Unlike option 1 where GPO would add value to the existing tapes, a vendor would perform this service in option 3. This could decrease the amount of control that could be exercised over the data file and its use—depending upon the contract. Although government information is not copyrightable, format is. The value added to government information by the vendor would be format-related and this could—but, depending on the contract, need not necessarily—restrict the type of use by depositories.

Costs. There are additional costs associated with this option for GPO and member libraries. GPO would subsidize either full, or a specified level of, access to an online data file. In consultation with the libraries, GPO would need to determine an equitable level of access per month to this data. Again, some libraries would actively and regularly use this *Register* file; others would perform just a few searches.

Vendors providing online congressional information and other governmental data have suggested that given the size of the program, a special rate for depository access could be provided, and that these same vendors already provide service to many of the libraries. In a somewhat similar arrangement, special rates online could be negotiated through FEDLINK (under the auspices of the Federal Library and Information Center Committee). This access could also include files other than the *Register*.

Libraries participating in this service would need a microcomputer modem and printer; and, to be successful, this equipment should be within the depository collection. Training costs would be minimal. Finally, there would still be the costs of retaining archival copies of the *Register* for 2 years, unless GPO reconsidered its current requirements.

ISSUES DISCUSSION

In this final section, four issues are discussed. These issues concern the need for developing a clear information policy on access to government information in electronic format through depository libraries.

Dissemination Formats in the Depository Program

Should government information in electronic format be disseminated to the public through the depository library program?

There are already many government information products in electronic formats that are unavailable to the public through the depository program. Congress needs to determine whether extensive electronic access to government information should be available through the depository library system, or if the current depository access to paper and microfiche printed products, and perhaps a few CD-ROMs and online datafile demonstrations, is an acceptable level of access, recognizing that increasing amounts of government information are available only in electronic formats.

Congress has repeatedly endorsed and supported the concept and the continuation of the depository program. As noted earlier, congressional support is evident for a number of reasons, but particularly because of:

- the recognition of the relationship between access to government information and the principles of a democratic form of government;
- the need for a guaranteed channel of access by the public to government information;
- a recognition, in part, that Congress should not rely solely on the agencies and the marketplace to provide channels of access to Federal information; and
- the acknowledged modest investment of approximately $20 million in disseminating this information through the GPO depository program, compared to the estimated several billion dollar cost of creating the information.[20]

As noted by members of the Subcommittee on the Library during the 1962 hearing on revising the laws relating to the depository libraries:

> After a publication serves its primary purpose in the functioning of the Government, what more useful additional purpose can it serve than to keep the American public informed on the workings of its Government and extending to private endeavors the benefits and advantages of the information compiled? The depository library system was specifically established to perform that vital function.[21]

Congress has also endorsed and supported, through the appropriations process and congressional oversight, agency dissemination programs employing information technologies. Implicit in this approval process is the acknowledgment by Congress that use of the technologies is necessary to accomplish agency missions or perform agency functions and represents a change in how agency business is and will be conducted.[22] This is also true for congressional operations as described in chapter 8. An April 8, 1987, resolution by the JCP accepted the recommendations of the Ad Hoc Committee on Depository Library Access to Federal Automated Databases and urged GPO to initiate pilot projects. By following this course, the JCP hoped to ensure that the depository program would keep pace with electronic information applications within the rest of the Federal Government and in the private sector. The June 17, 1987 JCP resolution authorizing GPO to treat publications in electronic format the same as paper and microfiche for the purposes of sale to the public is pertinent. The recent June 29, 1988 JCP approval of a series of demonstration projects is also important.

GPO policy on electronic dissemination to depository institutions is under revision due to a recent letter from the Chairman of the JCP supporting the position that:

> GPO's responsibility to print and disseminate Government information, as required by Title 44, clearly extends to the production and distribution of Government publications in these new formats.[23]

And the House Committee on Appropriations, Subcommittee on Legislative, recently approved distribution of CD-ROMs to depository libraries.

Congress has also recognized the overall importance of ensuring that government information is publicly available. The 1986 House Committee on Government Operations Report, *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview*, noted the need:

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[20] For discussion, see Peter Hernon and Charles McClure, *Federal Information Policies in the 1980's: Conflicts and Issues* (Norwood, NJ: Ablex Publishing Corporation, 1987); U.S. Congress, Committee on Rules and Administration, Senate Rept. No. 1587, 87th Cong., 2d. sess. (1962); and U.S. Congress, Committee on Rules and Administration, Subcommittee on the Library, *Hearings on S. 2029 and H.R. 8141 to Revise the Laws Relating to Depository Libraries*, Mar. 15-16, 1962, 87th Cong., 2d sess.

[21] U.S. Congress, Committee on Rules and Administration, Senate Rept. No. 1587, 87th Cong., 2d. sess. (1962) p. 18.

[22] OMB also recognizes the benefits of electronic information technologies: "We believe that there are substantial savings to the public and to the government; that the government can operate more efficiently and more effectively by moving to electronic media; and that there will ultimately be less burden on the public, ultimately less cost to the public, by moving toward electronic media." From Timothy Sprehe, "Developing a Federal Policy on Electronic Collection and Dissemination of Information, *Government Publications Review*, No. 11, 1984, pp. 353-362.

[23] Letter from the Honorable Frank Annunzio, Chairman, Joint Committee on Printing, to the Honorable Ralph Kennickell, Jr., Public Printer, Mar. 25, 1988.

> . . .to make certain that government data in the public domain—information that has been compiled using taxpayer funds and that is not classified or sensitive or exempt from public disclosure—will remain freely accessible and easily reproducible, whether the data is maintained in paper form or in electronic form.[24]

The legislative history and recent interpretations of the 1962 Depository Library Act and related provisions of Title 44 appear to support the inclusion of electronic products in the depository program. Clarification of congressional policy to this end would help to eliminate confusion on the part of users, depository libraries, private sector and not-for-profit information services, the agencies, and GPO.

In summary, the increasing use of electronic information services by all sectors of government, as is evident from the results of the GAO surveys of Federal agencies and Federal information users (see chs. 2, 4, and 5), requires new dissemination decisions by Congress and GPO concerning depository library distribution format options. Many information products will no longer be available solely in paper or microfiche format, may only be available in electronic format, and may incur additional costs associated with creating multiple formats.

Changing Costs of the Depository Program

Are the principles of free access still applicable, or are there new costs associated with the introduction of electronic access such that user fees or new funding mechanisms need to be considered?

Free access by the public to government information is an essential component to the current depository program. Depository members have always assumed financial responsibilities to provide users with free access to government information. Current estimates project that, on average, for every dollar spent by the Federal Government in depository appropriations, 10 dollars are invested in public access by each participating library.[25] Some of the responsibilities of the libraries include provision of space, materials processing, storage and retention of materials, reference service, interlibrary loan, and necessary equipment such as microfiche reader/printers.[26] A recent survey by the American Library Association of 16 depositories estimated that these institutions spend over $1 million on staff salaries per year to provide public access to their collections. This same survey noted that 8 libraries invested almost $750,000 per year in space and utilities, 15 libraries spent an additional $268,000 in acquisition costs beyond government-provided materials (e.g., additional copies of documents, indexes and reference tools, and the like), 11 libraries spent over $17,000 in telecommunication costs, and 14 libraries invested over $45,000 in supplies, copying, and the like. Users typically pay only copying fees for paper and microfiche materials, and, in some institutions, copying of diskettes. The financial contribution of GPO and the source agencies to the program is the cost of printing, publishing, and dissemination of government materials to the depository libraries.

The introduction of electronic information to the program may result in the need for a reexamination of the current relationship between libraries and the government. Because there are new costs associated with provision of electronic information, depository members and GPO will need to determine if the level of support currently provided by libraries and GPO will be sufficient for and applicable to providing electronic information. It has been stated that: ". . . it has become quite clear that to take full advantage of computer and telecommunications technologies will require added funds on the part of the library."[27] The nature of the relationship between the libraries and the government is one of cooperation. If the introduction of a new service or technology shifts the balance of the program and places even greater financial and/or administrative burdens on libraries, the cooperative infrastructure of the program could be changed or diminished. This shift in costs is already occurring as institutions increasingly move to using information technologies.

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[24] U.S. Congress, Committee on Government Operations, *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview*. House Report 99-560, 99th Cong., 2d sess. (Washington, DC: U.S. Government Printing Office, 1986) p. 9.

[25] American Library Association, Survey data from Questionnaire to Federal Depository Libraries, February 1988.

[26] For information on costs assumed by depositories see: Francis Buckley, "Cost Elements of a Federal Depository," Detroit Public Library, July 1976; Sandra Faull, "Cost and Benefits of Federal Depository Status For Academic Research Libraries," New Mexico State Library, May 1979; and Ann Bregent, "Cost of Regional Depository Library Service in the State of Washington," Washington State Library, July 1979.

Libraries, like the Federal agencies, are employing information technologies in support of their programs and in support of their users' information needs. The amount and types of information technologies used by libraries will continue to expand and change. As the newer technologies are introduced, the role of the library will become more of a gateway to information versus a repository for information, and more and more librarians will be asked to act as intermediaries for accessing information. Although there will continue to be a growing amount of "user-friendly" software to assist the user in employing information technologies, there will be an even greater need for information specialists to perform searches on sophisticated search services and technologies.[28] This evolving role of libraries also affects current resource-sharing practices by shifting access from a print-based to a "bimodal environment of a library providing access to document-based and electronic information-based resources."[29] With this shift comes new costs or reallocation of old costs to accommodate the expenses of electronic information. These trends are forcing librarians to recognize that there are additional costs associated with electronically formatted information and that these costs must be reconciled with current library practices and budgets.

There would be some reallocation of costs within libraries as more information and services become available electronically. For example, staff costs for the processing of incoming microfiche and paper would be reduced, as would storage needs. However, the costs of training, increased staff intervention, and equipment for electronic-based services would increase. Agencies will experience similar shifts in services and financial obligations.

Depository institutions now provide access to government information "free" of charge to users. Policies concerning government information available through online services to which value has been added vary from library to library. Some provide a minimum level of free access by number of citations or search time, whereas others charge the user for the full cost of the search. Depository librarians note the different kinds of access afforded by the different media, and these differences (in addition to cost) are taken into consideration during the mediation/reference process.

When considering the introduction of electronic products, it is also important to reexamine all formats and the criteria or guidelines employed in determining which format(s) are used for each government information product. Many government information products may not be available in more than one format due to budgetary and fiscal restraints. These restraints affect the depository program as well as other governmental programs. The depository community and LPS need to collectively determine which products can be provided in one format to effect savings for the program and, thereby, permit the inclusion of other information products in the program. The appropriate format for one library may not be the best format choice for another institution but, given the number of products entering the program and the cost of many of the new electronic products, budgetary constraints require further format decisions.

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[27] Susan K. Martin, "Technology and Cooperation: The Behaviors of Networking." *Library Journal*, vol. 112, No. 16, October 1987, p. 44.

[28] Association of Research Libraries, *Task Force on Government Information in Electronic Format*, Report No. 2, Apr. 21, 1987, p. 19.

[29] Ibid., p. 20, and Barbara Moran, *Academic Libraries: The Changing Knowledge Centers of Colleges and Universities* (Washington, D.C., Clearinghouse on Higher Education, 1984), p. 24; and Cline and Sinnott, *The Electronic Library* (Lexington, MA: Lexington Books, 1983).

If the basic underlying principle of the program is to retain free access by the public to government information, then Congress needs to recognize that there may be additional costs associated with the introduction of electronic information, and assist depository libraries and GPO in designing and financing new ways to make this information available to the public.

Reorganized Depository Program

Can the current depository system accommodate new responsibilities for electronic formats or should a new institutional structure be considered?

The current depository system is composed of a mix of organizations with diverse needs and clienteles. Members are at different stages of introducing information technologies, ranging from the highly sophisticated institutions with a broad array of electronic services to libraries just introducing OCLC services. *Any discussion of either a reorganized depository program, or a system that would include new formats, must consider this diversity.*

The current system can accomodate new responsibilities for the dissemination of electronic products, regardless of format, through the depository program. The current structure *may not necessarily be the most efficient or effective,* but many member institutions have some experience with electronic formats from providing other electronic services to patrons and/or incorporating electronic technologies into their operations.[30] More information concerning the effectiveness and user needs of the depository program will be available following the completion of a GPO study of the depository program. Fry noted in 1978 that the effectiveness of the depository program could only be: ". . . a matter of conjecture, because there is a lack of reliable descriptive and statistically significant data upon which to base policy decisions."[31] This remains true today. An evaluation of the effectiveness of the GPO depository library program may be merited. This evaluation could take place at the same time as the pilot and demonstration projects that will introduce and evaluate the delivery of electronic products. This is an opportunity to examine the future directions and organization of the depository program.

If electronic files are included, it is likely that many depository libraries will continue to select only those products and files most germane to their patrons. For some, this may not include electronic files for the foreseeable future. Individual libraries will decide whether or not electronic access to certain government files is a necessary addition to the collection. More and more government information will be produced in electronic formats. Some libraries may not accept these formats immediately, but will require electronic data in the near future to supplement paper and microfiche collections.

The level of resource-sharing and cooperation among depository libraries varies throughout the country. Generally, it has been noted that: "using technologies and databases already in place, librarians are beginning to identify the benefits and procedures of cooperative collection development and cooperative preservation of library materials."[32] In some States, such as New York, there is a very unified system, with the State library (a regional depository) taking a lead role in the operation of the program. In this case, the State library assists new libraries wishing to gain depository status, implements resource-sharing policies throughout the State, and seeks to achieve a consistent level of service throughout the State for access to government documents. Some regionals share resources, whereby a regional will accept responsibility for government documents, but the documents themselves are processed and housed elsewhere. This practice enhances collection development and resource-sharing within a State or region. Within this "system," it is also recognized that the degree of technological sophistication is varied (as are user needs); not all libraries need on-site access to all electronic files, nor do they have the capabilities to access these files. However, there is an infrastructure in place that can accommodate these institutions if access to electronic files or other data is needed. Other areas and States do not have a "collective" system and operate on a more independent basis.

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[30] For more information, see: Peter Hernon, Charles McClure, and Gary Purcell, *GPO's Depository Library Program: A Descriptive Analysis* (Norwood, NJ: Ablex Publishing Corp., 1985); and Peter Hernon and Charles McClure, *Public Access to Government Information: Issues, Trends, and Strategies.* (Norwood, NJ: Ablex Publishing Corp., 1984.)

[31] Bernard Fry, *Government Publications: Their Role in the National Program for Library and Information Services* (Washington, DC: NCLIS, December 1978.)

Some of those States and regions already employing cooperative arrangements have developed or are planning systems similar to the Association of Research Libraries' proposal for restructuring the depository library system. The ascending levels of responsibilities of basic, intermediate, and full service describe an informal network already in place in many parts of the depository system. This is just *one of many* possible directions that the depository library program could take as new technologies and electronic information applications are introduced.

Careful evaluation of the effects of these new information services on users, libraries, agencies, and GPO will be needed. When these effects are better understood, discussion could begin on possible reorganization alternatives. A mechanism for evaluating these effects might be helpful, such as a committee with representatives from LPS, the JCP and other relevant congressional committees, agencies with electronic products in the program, depository librarians, and members of the Depository Library Council.

Transition to a reorganized depository system would take time and effort. Current depository members would need to consider carefully a new system that would best serve the needs of libraries and users, and ensure that the resources within the region would be sufficient to satisfy resource-sharing requirements.

Changing Roles of Stakeholders

Does the increasing shift to electronically formatted information require a reexamination of the composition and relationships of the stakeholders in the depository program?

As noted in chapter 6, the depository program is a: ". . . cooperative program between the Federal Government and designated major libraries throughout the United States . . . "[33] Three participants are identified by Congress in this depository program relationship: the government, selected libraries throughout the United States, and the public. Throughout the history of the program, Congress and GPO have maintained this partnership and have relied on other services—both private sector services, such as Congressional Information Service, Inc. (CIS), and not-for-profit services, such as OCLC—to improve government information resources and to serve as other sources of access to government information. The different avenues of access—directly from an agency, through a depository library, or through a private sector information source—ensure access for a variety of constituencies, each with differing needs.

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[32] Op. cit., P. Martin, footnote 27, p. 43.

[33] Senate U.S. Congress, Committee on Rules and Administration, Subcommittee on the Library. *Depository Libraries, Hearings on S. 2029 and H.R. 8141 to Revise the Laws Relating to Depository Libraries*, 87th Cong., 2d. sess., Mar. 15-16, 1962, p. 25.

The depository library program represents one of several marketplace opportunities for private sector services, and this marketplace is expanding. Private information vendors perform numerous roles in the government information marketplace. Vendors reprint government materials (since there is no government copyright). For example, *The Effects of Nuclear War*, an OTA publication, was reprinted commercially under that title and as *After Midnight: The Effects of Nuclear War*. Private sector services design and create databases for Federal agencies and may even disseminate the data files for agencies. Private sector firms also add value to government data in all formats—paper, microfiche, and electronic. For example, CIS, Inc. develops indexes to congressional information, and the *Code of Federal Regulations* is available through OPTEXT on CD-ROM. Depositories and other institutions purchase and/or subscribe to these products for several reasons:

- to enhance existing government materials, for example, the CIS Congressional indexes;
- to have access to information in a more timely fashion; or
- to access value-added information that is not available through the government depository program.

The increasing shift by agencies to electronic information products is presenting new opportunities for private sector involvement in the information practices of government. Office of Management and Budget (OMB) Circulars A-76 and A-130 encourage agencies to employ private sector services when possible to minimize competition between government and the private sector and for reasons of economy and efficiency.[34] Generally, private sector firms support OMB policies because they advocate an expanding private sector role in government information practices. The Commission on Freedom and Equality of Access to Information noted in 1986 that:

> The Information Industry Association and other organizations representing information providers have vigorously opposed expansion of government publishing programs, advocating a policy that would forbid government entry into competition with existing private sector services and discourage the Government's undertaking new information dissemination programs using the new media unless there was an overriding national need and a demonstrated unwillingness or inability of the private sector to offer a service meeting that need.[35]

In the past, the Information Industry Association has opposed "direct distribution" of government information in electronic format to depository libraries by GPO, taking the position that information in electronic format does not fall within the statutory authority of the depository library program, and if distribution were to occur, ". . . the Government should rely upon the private sector."[36] Members of the Information Industry Association have voiced concern that, if GPO were to disseminate government information in electronic format, there would be direct competition with existing or prospective private sector services, and that some of these services would be forced out of business or otherwise suffer adverse economic consequences.

On the other hand, the Commission on Freedom and Equality of Access noted that:

> . . . libraries and university interests have wished to see the Government expand its publishing programs using the new media in order to offer broad and inexpensive access. They have felt that the principle of the depository library system developed for printed materials should be applicable to information in other forms as well.[37]

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[34] Hernon and McClure, *Federal Information Policies*, op. cit., footnote 20, pp. 244-246.

[35] Commission on Freedom and Equality of Access to Information, *Freedom and Equality of Access to Information* (Chicago, ALA, 1986), p. 75.

[36] Information Industry Association, *Public Policy Activities of the Information Industry Association*, (Washington, DC: IIA, June 1987), p. 49, and (January 1988), pp. 43-44.

[37] Commission on Freedom and Equality of Access to Information, *Freedom and Equality of Access to Information* (Chicago, IL: ALA, 1986), p. 75.

An expanded role for the information industry in the dissemination of electronic information in the depository library program is cause for further concern within the library community, due to the lack of explicit information policies.[38] As the information industry looks to OMB for leadership on electronic dissemination, the library community looks to the JCP. The separation of power issue causes additional tension because the agencies are caught between OMB's policies that emphasize the private sector role and JCP policies that emphasize a governmental and GPO role. The information industry tends to view government information as an economic commodity that should, to the extent possible, be sold for profit in an unregulated free market. In contrast, the library community (as represented by the American Library Association [ALA]) views government information as a public good and believes that reliance on market forces will not adequately ensure access to government information.

Several groups, including the National Commission on Libraries and Information Science Public Sector/Private Sector Task Force, the Commission on Freedom and Equality of Access to Information, and the ARL Task Force on Government Information in Electronic Format, have developed broad-based principles and/or key considerations that describe, clarify, and/or determine the roles of stakeholders in the government information creation, processing, and dissemination cycle. Some have suggested that it may be impossible to develop overall guidelines for electronic products, and that a case-by-case review may be needed for each data file.

There are several underlying principles of this overall debate on which most major stakeholders appear to agree and from which further congressional policy can be developed. First, public access to government information (regardless of format) is a basic right of U.S. society and is vital to the functioning of our democratic form of government. Second, there are different stakeholders in this public access process, all of whom contribute to its success. Third, the roles of the stakeholders are both complementary and competitive, and none can be completely excluded from the process. Fourth, the depository program, a key avenue of public access, is a unique dissemination program of the Federal Government, and is necessary to the continuation of the principles of public access.

An examination of the changing roles of the stakeholders in the depository program is important as new formats are introduced and demonstration projects commence. The recent controversy over an initiative by the Public Printer to "enlist the cooperation of non-government information service providers for the delivery of online information services to selected depository libraries" is one example of the need for a clearly stated congressional policy.[39] Reliance on a non-governmental service or government-contracted service to provide depository library program access to government information would signify a change in the depository program and would alter the current relationships.

Moreover, the basic premise of free access to government information in the depository program may conflict with a private sector value-added role. For example, once a government-generated database is purchased by a vendor, the vendor "adds value" to this data file, creating a new enhanced product. The vendor now may have proprietary rights associated with this new product or format (although not the information per se). If this product is the electronic file made available to the depositories, conditions may be placed on the use of that file. This would be a departure from current practice of unrestricted use that is primarily due to the nature of the format—paper and microfiche versus electronic. For the value added to the government information, the vendor deserves compensation. At the same time, the public's right to free and unrestricted access to government information is a cornerstone of the depository program. To the extent the private sector is directly involved in electronic dissemination to depository libraries, new kinds of pricing and access arrangements may be needed to preserve the basic objectives of the depository program.

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[38] Letter from Duane Webster, Interim Executive Director, Association of Research Libraries, to Ralph Kennickell, Jr., Public Printer, Dec, 28, 1987; and phone conversations with members of the depository library community and information industry, December 1987.

[39] Letter from Ralph Kennickell, Jr., Public Printer, to Honorable Frank Annunzio, Chairman, Joint Committee on Printing, Dec. 10, 1987.

Chapter 8

Electronic Dissemination of Congressional Information

From the top: Congressional Research Service Inquiry Unit (photo credit: Library of Congress); and the *Congressional Record* coming off the press (photo credit: U.S. Government Printing Office).

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Chapter 8

Electronic Dissemination of Congressional Information

SUMMARY

Congress, like the rest of the Federal Government, is presented with new technological opportunities and choices for the dissemination of information. Congress has a long and valued tradition as an open political institution and has, over time, made information about congressional processes and actions more readily available to the public. The advent of electronic formats for congressional information has created a window of opportunity for Congress to set the direction of congressional information policy for the years and perhaps decades ahead.

Electronic formats—such as online computer systems or compact disks—offer significant benefits to knowledgeable users, including, most importantly, improvements in timeliness of information, access to information, and efficiency of information search and retrieval. Those who have access to electronic formats, therefore, gain significant information advantages over those whose access is limited to traditional paper and microfiche formats.

At present, the members of Congress and congressional staff have access to electronic formats via internal legislative branch information systems and/or private sector vendors. Members of the general public have access through commercial information services if they can afford the rather substantial user fees. The problem is that many segments of the public cannot afford commercial rates, and, therefore, are effectively disadvantaged in terms of access to congressional information. Congressional information products such as the *Congressional Record*, bill status, committee reports and hearings, materials from support offices, and the like are vital to informed and effective participation in the legislative process. Therefore lack of access, or the inability to afford access, to electronic formats can easily translate into a political handicap.

Congress needs to determine the level of responsibility it wishes to assume for electronic information dissemination, and how active its role should be. In doing so, Congress may wish to establish an overall congressional information dissemination policy (which is currently lacking) that would help define the types of congressional information that Congress desires to be readily and publicly available in electronic formats. At the same time, Congress should also consider the roles of the various congressional offices and agencies (including U.S. Government Printing Office (GPO), House Information Systems [HIS], Senate Computer Center, Office of Technology Assessment (OTA), Congressional Research Service (CRS), General Accounting Office (GAO), Congressional Budget Office, and the like), as well as publicly funded programs such as the Depository Library Program (DLP), in making such electronic information available. Because of its growing role in providing electronic formats to Congress as part of the electronic publishing process, GPO is positioned to more actively participate in disseminating electronic formats to the depository libraries and public at large.

Congress may wish to review policies on public dissemination of support agency materials. For example, congressional policies limit direct public distribution of CRS reports to a small fraction (perhaps 1/10 of the total), although copies of many more are obtained by the public indirectly through individual member offices. As another example, a limited number of GAO reports and OTA summaries are available to the public free while OTA reports are available for a fee through the GPO sales program.

Congress also may wish to develop, as part of an overall policy, a clear intent as to the role of private vendors. Presumably, vendors would be able to obtain any publicly available congressional information, and repackage and resell that information, as they already do to some extent now. However, some vendors would like to contract directly with Congress, perhaps on a bulk rate discount basis, for electronic dissemination of congressional information to depository libraries, the general public, and the Congress itself.

Finally, given the large number of House, Senate, and congressional support offices and units involved with the creation and dissemination of congressional information, Congress may wish to establish an index to such information (through a congressional agency or a contractor), and a formal coordinating mechanism to maximize the exchange of learning and minimize the potential overlap, and to take advantage of the opportunities for technologically enhanced access. In many respects, congressional decisions on electronic dissemination of congressional information are just as important as prior decisions on radio and television coverage of congressional hearings and floor sessions.

INTRODUCTION

Congress has traditionally supported and endorsed meaningful citizen participation in its deliberations. One key facilitator of participation is the dissemination of congressional information, which has occurred in a variety of ways since the earliest days of the Republic and continues today with a mix of public and private information services participating in the dissemination process.[1]

Initially, Congress relied upon newspapers to publish information concerning the deliberations and acts of Congress. The first appropriation for public printing was made in 1794, and policies were effected which ensured distribution of Federal statutes to rural areas not well served by newspapers. And with the December 1813 resolution concerning government printing, "Congress became committed to the formal and regular distribution of its publications."[2] Reliance upon private printers ended with the establishment of GPO in 1860. GPO was created due to charges of corrupt printing practices and concerns about newspaper patronage. The establishment of GPO gave government, and particularly Congress, the means to produce documents for its own and the public's use. Congress also established the DLP to make Congressional and other governmental information more broadly available to the general public. The creation of the depository system was further affirmation by Congress of the need for a sound distribution system for congressional documents and information about governmental deliberations, to ensure widespread information dissemination in support of the democratic form of government.

The Printing Act of 1895 was the next major legislative action concerned with the printing and publishing practices of government. This legislation combined pertinent past legislation relating to the printing, binding, and distribution of government publications. This Act centralized the printing functions of government at GPO, institutionalized the distribution of the *Congressional Record*, and strengthened the depository library provisions among other things. The Act and subsequent amendments continue to be the basis for existing regulations and policies.

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[1] The information in this chapter is based in part on contractor reports prepared for OTA by Stephen Frantzich, "Public Access to Congressional Information: The Potential and Pitfalls of Technology Enhanced Access," January 1987; "Public Access to Congressional Support Agency Information in the Technological Age: Case Studies," Nov. 12, 1987; and "Public Access to Congressional Information in the Technological Age: Case Studies," September 1987. For related discussion also see, U.S. Congress, Office of Technology Assessment, *Federal Government Information Technology: Congressional Oversight and Civil Liberties*, OTA-CIT-297, (Washington, DC: U.S. Government Printing Office, February 1986), especially ch. 8.

[2] P. Hernon, C. McClure, and G. Purcell, *GPO's Depository Library Program* (Norwood, NJ: Ablex Publishing, 1985), p. 4.

Throughout this time, GPO and congressional lawmakers continued to place emphasis on improving the quality, timeliness, and efficiency of dissemination mechanisms. The predominant format available has been and continues to be paper or hard copy, with microfiche serving as a secondary format since the 1970s. Recent advances in information technologies present Congress with new opportunities for creating, producing, packaging, and disseminating the *Congressional Record* and other congressional materials in a more timely fashion. The issues facing Congress are not unlike those facing the Federal agencies as they move to incorporate information technologies into ongoing information activities.

As with debate concerning the future of the depository program, the central issue in the debate over congressional information concerns the level of public access to congressional information envisioned by Congress, particularly as facilitated by the new information technologies. In exploring this issue, there are several questions that require examination, including: the extent to which electronic formats permit enhanced access to congressional materials, and, if they do, what types of congressional information are especially useful in electronic formats; the degree to which Congress has a responsibility to ensure equitable access to congressional information in all formats; the need for an index to congressional information in order to improve public access to such information; the extent to which the introduction of new electronic technologies might change the GPO and private sector roles in dissemination of congressional information; and, finally, the extent to which the increasing pace of automation activities within the legislative branch requires a more coordinated information dissemination plan to enhance public access to congressional information.

This chapter will explore these questions through a description of current dissemination practices, and by case studies of the *Congressional Record* and of bill status information. These are followed by a brief review of other types of congressional information available and current dissemination practices of selected support offices. Finally, the chapter discusses several key cross-cutting issues.

CURRENT METHODS OF CONGRESSIONAL INFORMATION DISSEMINATION

Numerous access channels are available to users of congressional information, though not all avenues are open to all users nor do many users know how to access certain types of congressional information. Once a document is identified, it is possible to receive information directly from a congressional office, from a congressional committee, from House or Senate Document Rooms, and from the GPO Sales program. DLP is another avenue available to those who seek access to congressional information. This depository library channel, though not part of a "congressional" office or agency, is available throughout the country in approximately 1,400 libraries. Also, though not an "information" product per se in the traditional sense, C-SPAN (the Cable Satellite Public Affairs Network) provides direct access to televised congressional proceedings and stimulates interest in congressional materials. Finally, access to congressional information is available through the press and via private information services that provide congressional information in all formats.

Congressional offices are often the first stop for many seeking congressional information. Congressional staff will obtain for constituents congressional documents from other offices, committees, and congressional support offices such as OTA or CRS. An estimated 25 percent or more of incoming congressional mail are information requests from constituents.

Congressional committees distribute their own hearings, committee prints, and reports. The Balanced Budget and Emergency Deficit Control Act of 1985, Public Law 99-177, resulted in a tightened limit on the number of copies available to committees, thereby reducing availability of congressional information to the public through this channel. Committees are provided 300 copies of each product today, compared with an average of 612 in 1985. It has been noted that committees are now less willing to give away copies of congressional materials from their limited supply.[3]

The House and Senate Documents Rooms were originally intended as the primary access point for those seeking free congressional products. Distribution rules for the two Rooms are similar, though not identical. The stock of the Rooms is composed of the following: bills, resolutions, committee reports, laws, and congressional documents from the current Congress. Committee reports are only in stock on a "as available" basis, and other documents are generally reprinted or photocopied as necessary. Committee hearings are not distributed by the Document Rooms. *Calendars of the United States House of Representatives* are available from the House Document Room, and the *Senate Calendar of Business* is distributed through the Senate Post Office with no direct public dissemination. Finally, both Rooms retain selected materials from previous Congresses, although coverage is very incomplete.

Requests to Document Room staff are either in person over the counter, by phone, by mail, or through electronic mail. No formal records are maintained, though Document Room staff do estimate the number of individuals served and do distinguish between congressional staff requests and those of the general public. It is important to note that many of the congressional staff requests are in response to constituent inquiries. The House Document Room serves approximately 300 in-person requests per day, with over half of these being "direct" requests from the public. The Senate Document Room serves approximately 400 to 500 in-person requests daily with no comparable estimate on the number of "direct" public requests. The Senate Document Room responds to phone requests only from congressional staff, totaling approximately 300 daily calls that are usually for multiple documents. The House Document Room responds to approximately 275 congressional staff requests for information each day by phone, and another 45-50 requests are recorded each night on a telephone answering machine. The volume of mail requests varies depending on the day of the week and the visibility of congressional proceedings. The House Document Room receives between 125 to 250 mail requests per day, and the Senate Document Room receives approximately 200 to 250 mail requests per day. Both Senate and House Document Room staff note a long term growth in mail requests. Finally, congressional staff can place orders for documents from the House Document Room through an electronic mail system.

The Document Room distribution is primarily used by more "sophisticated observers of government."[4] Commercial firms, lobbyists, public interest groups, and law firms systematically use the Document Rooms to access congressional information.

Budget reduction measures resulted in the establishment of the Congressional Sales Office under the Superintendent of Documents (SupDocs) at the GPO. This Office receives 25 copies of hearings and prints. Staff do order more copies for those materials thought to be of greatest interest and, therefore, likely to be in higher demand. Items are sold on a nonsubscription basis over the counter, by mail, and by telephone. GPO also offers permanent subscriptions to government documents, and this includes subscription sales of electronic tapes of selected congressional documents.

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[3] Stephen Frantzich, "Public Access to Congressional Information in the Technological Age: Case Studies," op. cit., footnote 1, p. 16.

[4] Ibid., p. 21.

Private information services also provide access to congressional information. For example, Congressional Information Service (CIS) serves as a source of congressional material. CIS offers extensive indexing and abstracting of congressional documents, sells hard copy indexes to congressional information, and provides online indexing via DIALOG. The CIS indexes have become the standard source and, in fact, are used by GPO as a master list. In addition to these other services, CIS sells yearly microfiche subscriptions and individual microfiche subcriptions of bills, laws, committee prints, committee reports, committee documents, and hearings.

Several private information vendors are offering congressional products in electronic format. Commercial efforts focus on products such as the *Congressional Record* and bill status as these are time sensitive and can be much more useful in an online format. The vendors purchase the computer tapes produced by GPO that are used in support of the printing process, remove the GPO printing codes, and add search and retrieval software. The searching software employed by the different vendors varies considerably.

In addition to the access channels described above, there are two other not so direct avenues for those interested in obtaining congressional information. These are telephone hot lines operated within Congress and outside and the DLP. The LEGIS office within the House Information Systems Office provides bill status information over the phone or will send a printout with information concerning House and Senate actions. Party leadership offices' also provide scheduling information (recorded messages) that is accessible by the public. Finally, different interest groups, such as the Chamber of Commerce, have recorded message services for members but these services are available to the general public as well. These services usually provide minimal information concerning current congressional actions and news.

The DLP is a cooperative program between the Federal Government and approximately 1,400 libraries. The Government provides copies of government-produced materials free of charge, and the libraries, in return, provide housing for the documents and access to this information free of charge to their patrons. Congressional documents are some of the most frequently used materials in depository collections. Many of the congressional materials are dual format items, available in either paper or microfiche. (For more information on depository libraries, see chs. 6 and 7.)

CONGRESSIONAL INFORMATION PRODUCTS CASE STUDIES: *CONGRESSIONAL RECORD* AND BILL STATUS INFORMATION

Case studies of the *Congressional Record* and of bill status information are presented to illuminate many of the issues and questions facing Congress as electronic information technologies are introduced in support of ongoing programs.

Congressional Record

Production

The *Congressional Record* is produced nightly and delivered to Congress by 8:00 a.m. the following morning, before the session begins. Information in all formats, typed, hand written, and electronic, is received by GPO for reproduction in the daily printed *Record*. Material from the floor includes typed transcripts from floor reporters (approximately 20 percent), typed speech drafts from Members, copies of bills, newspaper articles, and other documents Members wish included in the *Record*. Much of this information to be inserted includes hand written corrections. Members have the right to "revise and extend" their remarks as taken down on the floor, or to insert an entirely new speech. It is GPO's job to "weave and blend" this material into the *Record*.

GPO keystrokes all documents anew, except for the text of some bills and resolutions and recorded votes in the House. Approximately 56 percent of the text of bills are in electronic format; the remainder require keystroking by GPO. Although much of the material inserted in the *Record* is created on word processors, it is not received in electronic form by GPO. GPO must transfer this information into electronic format to produce the typeset pages and the photographic plates from which the hard copies of the *Record* are printed. In the process, magnetic computer tapes of the *Record* database are created. From this perspective, the creation of the magnetic tapes is solely to support the printing process and, therefore, is a byproduct of the printing process.

As material is received from the floor reporters of the House and the Senate, it is marked for identification purposes, edited for proper format, and keyed into the database. Those materials, such as bills, that are prestored in electronic form are then inserted, and the data are proofread. Since all sections of the *Record* do not arrive at the same time or in the order they are to be printed, electronic assembly of the final product is required prior to the creation of typeset pages, plates, and printed copies. Proofreading is accomplished in galley format prior to electronic assembly, and final corrections are made to the photocomposed page before negatives and printing plates are prepared. The presses then begin running the hard copy version of the *Record*. Final corrections to the electronic version are not a priority effort at GPO but are completed as soon as possible.

In addition to the paper format, microfiche copies are produced for distribution. A contractor produces both the microfiche master and copies for the GPO.

There are two other products, the *Congressional Record Index* and the bound *Record*, related to the daily *Record*. The Index is created largely by hand and is published by GPO biweekly, though automation has been introduced to speed up this process. The yearly index accompanies the bound *Record*. The bound copy of the *Congressional Record* requires a second revision to the daily *Record* with new photographic plates created. Production of the bound *Congressional Record* is a number of years behind; the last bound volumes published covered the years 1982 (vol. 128) and 1985 (vol. 131) with work proceeding concurrently on years 1986, 1984, and 1983 (vols. 133, 130, and 129). The last Index produced was for the year 1980 with the 1981 Index due out in 1988, and the 1982 Index also in production and expected to be completed in late 1988.

Dissemination

Over 22,000 copies of the *Congressional Record* are distributed daily when Congress is in session. Distribution is made mostly on a predetermined basis, with many copies distributed free to individuals and organizations as required by law or designated by Members of Congress. SupDocs also sells single copies of the *Record*. Each Member of the House is allocated 25 copies of the *Record* to distribute and each Senator, 37 copies.[5] Recipients can request copies of the *Record* in paper or microfiche format. For DLP distribution, the *Record* is a dual format item with libraries indicating a preference for hard copy over microfiche formats (942 for hard copy v. 307 for microfiche). Table 8-1 provides data on the current GPO distribution of the *Record*. Several private firms also distribute microform and hardcopy versions of the *Record*.

Since July 1, 1987, *Congressional Record* magnetic computer tapes have been sold by GPO.[6] Individual tapes can be purchased for $175 or yearly subscriptions at $29,300 from the SupDocs Sales Office. The tapes sold are equivalent to the printed copy with all "stripped in" corrections; there is a delay for the corrected computer tape of up to 72 hours.

Three commercial vendors, Legi-Slate, Mead Data, and Congressional Quarterly, purchase

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[5] Microfiche copies of the *Record* count as only one-third of a hard copy in Member distribution quotas.

[6] A June 17, 1987 resolution by the Joint Committee on Printing directed GPO to sell government publications in electronic format.

Table 8-1.—GPO Distribution of the *Congressional Record*

	Microfiche	Paper
Free distribution		
Designated by Representatives	676	7,765
Designated by Senators	175	3,147
Government departments	1	2,788
Joint Committee on Printing (additional distribution to Congress)	18	2,002
Depository libraries	306	942
House of Representatives (by law)		680
Congress (officials)		301
Press		202
Ex-members		182
Government agencies	25	174
Governors, independent establishments	3	40
Courts		36
Public Printer		31
International Exchange	83	
Sales Distribution		
Superintendent of Documents (subscriptions)	100	2,860

SOURCE: U.S. Government Printing Office, 1987

subscriptions to the *Record* tapes which are used in support of online services. Congressional Quarterly and Legi-Slate offer the *Record* online as a subscription service, charging a single yearly fee for unlimited searching. Mead Data Central charges an hourly connect fee. Each service has employed different search and retrieval software; hence access to congressional information within each file is different and varied.

GPO, utilizing its own tapes, has developed an online *Congressional Record* database for use by Members and staff. This service is currently being tested in several congressional offices and is planned to be offered to all congressional offices and support agencies within a year. The GPO online service will include Senate and House proceedings, Extensions of Remarks, the Daily Digest, and the Congressional Record Index. The system will provide electronic search and retrieval capabilities, but is also designed to facilitate the creation of secondary products for Members and staff. The House Information System Office (HIS) also has the *Congressional Record* full text online for House Members and staff. HIS relies upon GPO tapes for original input into their online system. Finally, the Library of Congress provides search and retrieval of *Congressional Record* abstracts in the SCORPIO system.

Over two-thirds of the Members of the Senate have purchased private sector services, primarily Legi-Slate, with congressional information online, whereas the House has relied upon HIS and its information services pursuant to a decision by the Committee on House Administration.

The growing demand for an electronic version of the *Congressional Record* has generated concern regarding the role of the GPO in the future and the nature of its products. First, some have noted that an electronic *Record* could reduce sales of the hard copy version. Others contend the opposite, namely, that electronic searching of the *Record* will boost sales because it will improve indexing and access to the hard copy version. Experience with some other information products has indicated that, when hard copy documents became available electronically, sales of the hard copy did not diminish but, instead, increased. Also, to the extent that paper is the preferred format for certain classes of users, the demand for paper copies of the *Record* is likely to be unaffected.

Second, a gradual shift to an electronic *Record* and phasing out of conventional printing could eventually realize some productivity improvements and savings at GPO. It would also help cut costs if GPO were able to receive a higher percentage of the *Record* input material in electronic form so as to minimize rekeyboarding.

Third, there could be changes in GPO net revenues for the *Record*, both in paper and electronic formats. Sales of the hard copy version realize $675,000 per year for SupDocs. The bulk of the costs associated with producing the *Record* are fixed and not heavily dependent upon the number of copies printed. A reduction in the volume of copies printed could increase unit costs and reduce revenue to GPO unless prices were raised. Conversely, if the electronic *Record* encouraged additional demand for the hard copy, GPO revenues could increase without significantly increasing costs. In terms of revenue, each of the 3 current computer tape subscriptions is equivalent to over 125 hard-copy subscriptions.

Fourth, HIS and private vendors are in a potentially competitive position with GPO with respect to online access to the *Record*. These relationships need to be examined with respect to minimizing overlap and duplication (with regard to HIS), and to developing complementary roles to the extent possible.

Fifth, there is concern within both Congress and GPO about the content and accuracy of government publications. GPO is striving to improve the turnaround time for corrections to the daily *Record* electronic database and, hence, to reduce the time lag for making corrected tapes available to subscribers. A priority is to ensure that the online *Record* is accurate and complete, regardless of the provider. Some further *Record* corrections and revisions are made by Members (approximately 5 percent of the total material) after the corrected tapes go out, but prior to production of the bound *Congressional Record*. There is no procedure at present for exchanging an incorrect or incomplete daily version for a revised bound copy version of the computer tape. Once GPO distributes the electronic tapes to subscribers, all control or revision of the information is lost.

The *Record* serves as a primary source for determining legal intent and is widely used by the legal community and government alike to this end. The ability to search the *Record* electronically, particularly over several years, would aid in such research. There is concern that the information maintained by the vendors will not match that found in the bound *Record*. A related concern is that the new flexibility inherent in an online system allows for cutting and pasting of congressional information, creating a new information product, possible not reflecting the appropriate context of a Member's vote or statements. Changes in congressional procedures regarding Member corrections and revisions to the *Record* could be considered in order to minimize or eliminate content differences between the daily and bound *Record*.

Bill Status Information

With thousands of bills introduced by Members each Congress, it is important for individuals or interest groups to monitor the progress of legislation. Monitoring the status of legislation requires tracking bills through numerous stages and different committee jurisdictions. Entire bills can be included in other pieces of legislation, and the official title may not reflect the true or full content of the bill. It is possible to miss amendments to bills or other substantive changes if an individual is only following a bill by number or title.

Current Practices

The Congressional Research Service (CRS) creates the hard copy *Digest of Public General Bills and Resolutions*. This includes a summary of bills introduced, the sponsor and cosponsors of the legislation, and any action taken on the bill. Originally, the *Digest* was printed a number of times each year and provided relatively frequent updates on legislative action. Since CRS automated the *Digest*, it is only printed on an annual basis, and is not a priority item, and thus is usually even further delayed in reaching the public. However, the Joint Committee on the Library has recently authorized the Library of Congress to discuss with GPO the possible sale of daily computer tapes prepared by CRS which update the online system.

The bill status system was one of the first automated information systems of Congress, and is a timely system reflecting Congressional legislative action less than 12 hours after it occurs. The Bill Status system is, in fact, 3 separate systems which share information. The House and Senate create computer tapes of all official actions taken within the chambers, and CRS develops bill digests, abstracts, and indexing for each bill introduced. Each bill is indexed by one or more categories to facilitate searching. HIS, the Senate Computer Center, and CRS share their data and then create separate comprehensive databases for their users. Users can search for bills by bill number, sponsor, index terms, and more. Once identified, information is available on bill sponsors and co-sponsors, actions on bills at successive stages of the legislative process, and a summary of the legislation. Within the LEGIS system for those bills reaching the floor voting stage, aggregate voting totals are available, though only the Members and staff can access how individual Members voted for the first 24 hours after a vote; after this time, only the leadership can access this information.

The bill status system also permits retrospective searching of previous legislation. This capability is helpful when trying to shepherd current legislation through the process and to research the history of prior legislation. For example, retrospective searching can illuminate types of legislation a Member tends to sponsor or co-sponsor or oppose, or determine the types of legislation certain committees favor or oppose. As a consequence, the previous year's data is maintained online. The ability to search current and retrospective data on Members has been used by interest groups, national political parties, and individual candidates to gather information on Member's voting records, legislation introduced, supported, or opposed, and their legislative success rates. HIS and the Senate Computer Center will, for a Member, provide a summary of the individual's legislative efforts and the results. Comparable services can be purchased from commercial sources by individuals or comparable information can be gleaned with considerable effort from hard copy records.

Access to Bill Status Information

The daily *Calendar of the United States House of Representatives* provides a bill status chart of major legislation and a detailed "History of Bills and Resolutions." The *Calendar* is a product of the Office of the Clerk. Complete cumulative histories of legislation are printed on the first legislative day of each week the House is in session, with subsequent daily listings including only new action. Calendars are distributed free by both Document Rooms and are also distributed to the depository libraries.

The *Digest of General Bills and Resolutions*, a CRS product, is disseminated to depository libraries and subscribers. The hard copy is less accessible than the electronic format for two reasons. First, the hard copy is not timely or current for those trying to keep abreast of congressional actions. Secondly, there is limited indexing in the *Digest*, inhibiting easy bill identification and tracking, particularly for those bills amended more than once. However, as noted earlier, GPO and the Library are exploring the possibility of making daily computer tapes available to the private sector.

Private sector information products such as the *Congressional Quarterly* and the *National Journal* track major legislation, but do not cover a full range of issues. CIS publishes an annual *CIS Index of Legislative Case Histories*, with abstracts of those bills that become law and some detailed analysis of major legislation. The Commerce Clearinghouse produces the *Congressional Index*, a looseleaf service, containing the status of both congressional and state legislative bills, listed by number. There is also a daily tracking service available from Commerce Clearinghouse, known as the Congressional Legislative Reporting Service.

Both the House and Senate Bill Status Offices respond to phone requests from their chambers. Public requests are directed to the House LEGIS office, located in the Clerk's office, for an oral response or for a hard copy of the relevant print out from the LEGIS system. The cost of the LEGIS print out is $0.20 per page with a $5.00 minimum. Table 8-2 details the volume of external and internal phone requests for bill status information handled by the House LEGIS system.

Members and congressional staff have direct access to LEGIS from their own terminals. It is possible to specify bills of particular interest and receive updated information whenever there is action on this legislation. Most congressional offices respond to constituent requests for bill status information, but there is no information on how many requests are answered in this fashion. Terminals are available to the public at the Library of Congress

Table 8-2.—Volume of Telephone Bill Status Requests Handled by the House LEGIS Office

	Total number of requests and percent of total by year		
Source of request	1984	1985	1986
House offices	183,635 (66%)	152,062 (65%)	137,839 (64%)
Senate offices	6,438 (2%)	5,331 (2%)	5,684 (3%)
Others (public and agencies)	87,420 (32%)	72,811 (33%)	82,648 (33%)

SOURCE: House LEGIS Office, 1987.

to access the bill status system. This system does not permit public access to information on a Member's voting record or to tag certain bills for monitoring on a continuous basis.

A number of commercial firms have developed online databases with bill status information. Vendors purchase bill text computer tapes from GPO; the vendors then add additional information such as action on bills and voting records of Members, and necessary search and retrieval software. Legi-Slate, Congressional Quarterly's Washington Alert Systems, and Commerce Clearinghouse's ELSS or Electronic Legislative Search System, are current online services offering bill status information, all with differing capabilities, pricing schedules, and information.

In sum, there are multiple avenues for dissemination of bill status information, but with differing levels of access and cost. In the case of bill status information, electronic information technologies employed to improve congressional operations have, at the same time, altered access by the public to this same information. Members of the public who rely on only the printed versions of the bill status information, the *Digest of General Bills and Resolutions* and *Major Legislation of the Congress*, have access to retrospective information, but not to current information about the legislative process.

DISSEMINATION PRACTICES OF CONGRESSIONAL SUPPORT AGENCIES

Several congressional support agencies were established by Congress with the primary purpose of providing Members and staff with information and analyses for congressional decisionmaking. In the process of assisting Congress, the agencies develop numerous information products. Each agency employs differing access and dissemination practices, and the introduction of electronic information technologies presents new opportunities and challenges with respect to their philosophies and operations concerning public access. Dissemination practices of three of the congressional support agencies, the Office of Technology Assessment (OTA), the General Accounting Office (GAO) and the Congressional Research Service (CRS) of the Library of Congress are briefly described. Some of the changes and opportunities resulting from the introduction of technologies are discussed in the following section.[7]

Office of Technology Assessment

OTA was established in 1972 to provide Congress with information on a wide range of public policy issues concerned with scientific and technological change. OTA was created to remedy a perceived lack of objective, non-partisan, and expert analyses on scientific and technical issues relevant to congressional deliberations.

OTA's organizational structure and the nature of its work processes set it apart from its sister agencies. OTA is governed by the Technology Assessment Board (TAB), composed of 12 Members of the House and Senate. The TAB determines which assessments OTA staff will undertake based on proposals developed by OTA staff and requested by either the chairman, ranking minority member, or a majority of committee members of any congressional committee. If approved by the Board, these assessments can take up to 2 years to complete and are comprehensive in nature.

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[7] Dissemination practices for the Library of Congress and the Congressional Budget Office are not discussed.

Throughout the study process, OTA research efforts are open for external review and public participation. This process includes extensive use of outside consultants, formal reviews by panels of experts, distribution of draft reports and papers to interested parties, and extensive internal and external review prior to publication. The Technology Assessment Act of 1972 (Public Law 92-484) stipulates that OTA products (as distinct from the research process) may be made publicly available:

> Assessments made by the Office, including information, surveys, studies, reports and findings related thereto, shall be made available to the initiating committees of Congress. In addition, any such information, surveys, studies, reports, and findings produced by the Office may be made available to the public except where—(1) to do so would violate security statutes; or (2) the Board considers it necessary or advisable to withhold such information . . .

OTA offers a number of information products to the public, including final reports, one-page briefs of each report, and summary documents which highlight the full reports. OTA also produces staff papers, technical memoranda, special reports, background papers, testimony, and contractor reports. OTA draft reports, testimony, and other materials are keyed in on word processors. A "paste up" camera ready version of the final assessment is prepared by OTA publishing staff using electronic photocomposition where possible, and this version is then sent to GPO for printing.

There are multiple avenues for dissemination of OTA information products. Summary reports are sent out to congressional staff and Members, interested persons on OTA mailing lists, and individuals and organizations requesting information on a particular subject. Full reports are also sent out, but to a more limited mailing list, usually including study participants, advisory panel members, and interested congressional staff and members. OTA reports can be purchased from the GPO SupDocs, and from NTIS; NTIS also stocks selected OTA contractor reports. Sales of OTA reports vary widely depending upon the topic and press coverage. GPO may sell several hundred to over 25,000 copies of a report.

OTA reports are available to depository libraries. Of the depository libraries, 771 elect to receive OTA reports. OTA reports are distributed in hard copy or paper, but contractor reports are only available in microfiche.

The OTA Information Center receives a number of telephone calls per month to confirm a report title, learn how to purchase an OTA report, inquire about a study, and the like. The Information Center is open to the public, and some users rely on the Center for access to OTA reports. The Information Center also maintains QuOTAtion, an in-house database of OTA publications. This file includes citations to 375 reports, staff papers, and technical memoranda. The database is used to answer staff and public information requests.

The OTA Publishing Office produces *OTA Publications* (annually) and *Assessment Activities* (quarterly) pamphlets; these are widely distributed. This office also responds to numerous inquiries for OTA reports and other publications.

OTA provides summaries and reports to congressional staff for mailing to constituents in response to information requests. This distribution is in addition to copies sent by OTA to congressional offices at the completion of a project. Practically all formal OTA information dissemination is in the form of printed documents. There have been a few videotapes, audiotapes, and diskettes produced in connection with specific projects.

General Accounting Office

GAO was established in 1921 as the auditor for the Congress, and today this role has broadened to include agency program reviews to better assist committees and Members. These reviews can include social, organizational, technical, and financial aspects of programs and activities.

GAO assists Congress with a number of information services. Program reviews are carried out in response to specific congressional requests from committee chairman, ranking minority members, and/or individual members. GAO also has a significant number of on-going reviews required by law. The agency's primary function, the provision of audits and program evaluations, is supplemented by other services such as provision of legal services to Congress on issues concerning government programs and activities, and reviews of proposed recisions and deferrals of government funds. Other services include "resolving bid protests that challenge government contract awards, assisting government agencies in interpreting the laws governing the expenditure of public funds, and adjudicating claims for and against the government."[8]

GAO produces a number of research products for Congress. This can include fact sheets, testimony, staff studies, Comptroller General Decisions, and briefing and detailed reports. Fact sheets provide limited background information, no conclusions, and pertinent information on specific questions. Staff studies are compilations of previously produced GAO and other work on a given subject. Comptroller Decisions are rulings from the Comptroller General on personnel and procurement issues. Detailed reports provide in-depth information on the operation and background of agency programs and include conclusions and recommendations. Briefing reports contain much of the same information found in detailed reports, including conclusions and possible recommendations but provide less background data. Table 8-3 summarizes the volume of GAO information products distributed in 1987.

All unclassified GAO products are available to the public through a variety of channels.[9]

- First, GAO maintains a mailing list of interested parties who receive copies of selected materials.
- Second, individual depository libraries can elect to automatically receive all or selected GAO reports.
- Third, GPO maintains a distribution outlet (operated by a contractor) that handles orders for GAO materials. The first five copies of GAO reports are free to requestors with a $2.00 fee for each copy thereafter.
- Fourth, GAO publishes several newsletters or pamphlets announcing their publications: a monthly pamphlet entitled

Table 8-3.—GAO Information Products Distributed In Fiscal Year 1987

Product	Free distribution	Sales
Briefings	184,616	
Fact sheets	97,606	
Reports	536,582	15,508[a]
Staff studies	9,684	
Testimony	77,812	
Solicitor General's decisions	8,296	
Letters	3,930	
Memos	566	
Other	34,932	
Total	954,024[b]	
Depository library standing orders		
GAO Annual Report	802 (microfiche)	
Reports to Congress	587 (microfiche)	
Bibliographies of publications	651 (microfiche)	
Documents, catalog of reports, decisions, testimony	653 (paper)	
Comptroller General decisions and testimony	505 (microfiche)	

[a] Virtually all sales are of Reports.

[b] 484,782 of the free items distributed did not involve a specific request, but rather were sent to individuals on established mailing lists.

SOURCE: General Accounting Office and U.S. Government Printing Office, 1987.

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[8] GAO, *Serving the Congress* (Washington, DC: GAO, n.d.) p. 20.

[9] Requesting committees control the time of release of some GAO materials.

> *Reports Issued in . . . (listing of current month)*; an *Annual Index of Reports Issued in FY 19xx*; a monthly catalog of GAO publications entitled *GAO Documents*; and bibliographies on specific subjects such as Energy, Health, and the like. A newly revised and reinstated service, the *GAO Journal*, is intended to serve as an internal communication tool and as a means of informing a larger public audience about GAO's activities.

GAO maintains an online bibliographic database in its Information Handling and Support Facility (IHSF). This facility is contractor operated and provides bibliographic cataloging, indexing, and abstracting of GAO documents. The IHSF facility also maintains the document inventory which contains GAO Audit Reports (Reports, Fact Sheets, and Briefing Reports) from 1978 to the present and some from as early as 1972. This facility processes requests for copies of GAO materials. In 1987, the IHSF received over 190,000 requests. Of these, nearly 30,000 involved database searches to track or locate information products. GAO products are disseminated in hard-copy format but originate in electronic form. Short reports, those under 60 pages, are printed in-house; an outside contractor is employed for the electronic photocomposition phase of the printing process. Longer reports are printed by GPO.

Congressional Research Service

CRS provides both immediate and in-depth, detailed analyses on all subject areas of interest to Members of Congress and staff. As the reference and research arm of Congress, CRS draws upon the broader resources and services of the Library of Congress. The CRS began as the "legislative reference bureau" (later known as the Legislative Reference Service) in 1914 to better respond to Congressional inquiries as distinct from library operations and functions. The Legislative Reorganization Act of 1946 authorized the Legislative Reference Service as a permanent department within the Library, and the development of staff specialists in a wide range of subjects. The Legislative Reorganization Act of 1970 provided the newly named Congressional Research Service with research, administrative, and fiscal autonomy within the Library and expanded CRS capabilities and services.

CRS produces a variety of information products for Members and staff. These products include responses to telephone inquiries, confidential reports, CRS reports, issue briefs, info packs, and databases, among others.

CRS receives well over 1,000 inquiries per day from Congress and responded to a total of 443,400 inquiries in 1987. CRS performs confidential analyses on policy issues for Members and committees. These analyses remain the property of the requestor unless the Member or committee explicitly provides approval for a wider dissemination. Annual appropriations language prohibits CRS from publishing its research without prior approval of one of CRS' oversight committees. While 10 percent of CRS research is published by Congress in congressional documents such as hearings, 90 percent of CRS research remains unpublished.

CRS Reports, Issue Briefs, and Info Packs are three products developed for use by Members and staff. CRS Reports are in-depth, longer term analyses on particular subject areas whereas Issues Briefs are short and succinct analyses of pressing policy issues. Each Issue Brief contains information on current legislation, relevant hearings and documents, a chronology of events, and a bibliography, all pertinent to the topic of interest. Congress has online access to Issue Briefs. Info Packs are designed to satisfy general audiences, and these packs include a collection of clippings, CRS Reports, speeches, and the like. Over 100 Info Packs are actively maintained on a broad range of subjects.

CRS also produces an SDI (selective dissemination of information) online and in offline print-outs for congressional staff. Congressional staff develop a profile of policy interests, and the CRS database is searched weekly to alert staff to new articles, or other information products on these topics. Staff, following a review of the SDI information, can order specific articles of interest. Some of the SDI information is maintained within the Library's optical disk project, which maintains full text of over 70 periodicals.

CRS maintains several of the files in SCORPIO, the Library of Congress' automated information system. The legislative file (as discussed earlier), the bibliographic citation file, and the issues file are the responsibility of CRS.

CRS actively disseminates its products to congressional offices. For example, once released, reports and issue briefs are listed in the annual *Guide to CRS Products*, with new products highlighted in the monthly *Update*. Some CRS products are also announced in the *CRS Review*, a digest of recent CRS policy analyses. It is published 10 times each year for congressional use and is sold by GPO to the public. When responding to congressional information calls, these same products may be a part of the information package offered to staffs. Finally, CRS information products are listed in the Citation File (CITN) which is available online to all congressional offices through the SCORPIO system.

The CITN file is a bibliographic database designed to support the research needs of the CRS research staff and congressional clients and includes citations to articles, reports, and papers of potential relevance to congressional policy making. An abridged form of this file, BIBL, is available to the public via terminals in the Library of Congress. Those items not directly available to the public such as CRS *Reports* are excluded from the database. The CITN file is undergoing revision at present and will eventually be replaced by two files: a CRS Products File, and a public policies literature file. The new products will augment the current bibliographic information with a one page summary of each CRS document, and are intended to both speed up the searching of files and increase the awareness and accessibility of CRS materials within the Congress.

Congressional offices serve as primary disseminators of CRS materials. CRS products can be ordered by congressional staff via telephone, letter, or electronic mail. CRS cannot determine the amount of information used by congressional staff for internal use versus that ordered to answer a constituent's request for information. The volume of CRS products distributed (in hard copy format) in 1987 is indicative of their use and popularity: about 83,000 CRS Reports; 230,000 Issue Briefs; and 166,000 Info Packs.

There is some dissemination of CRS materials through private sector services. For example, University Publications of America (UPA) offers a set of CRS *Reports* on microfilm and a limited index. This company does not receive the information directly from CRS, but instead receives the materials, including *Reports* and some *Issue Briefs*, through Member offices.

DISCUSSION OF CROSSCUTTING ISSUES

The incorporation of electronic information technologies into congressional operations, its deliberations, the work of its support agencies, and of the GPO, changes access to congressional information by all participants in the process. The introduction of electronic technologies to assist in the recording, management, and dissemination of congressional information, in fact, challenges the traditional modes of information access and provides new opportunities for enhanced access by both Congress and the public to congressional information. The increasing use of these technologies to support congressional operations presents Congress with a new opportunity to examine its dissemination practices and to determine what level of access to congressional information should be afforded to the public beyond current publicly and privately offered services.

Five key issues are discussed below.

Benefits of Electronic Formats

Electronic versions of congressional information involve considerably more than a new storage medium for the production of the hardcopy document. There is an unlocking effect to information found in the electronic *Congressional Record*, for example, because of the search and retrieval capabilities inherent in online and CD-ROM systems. Electronic products can permit a user to perform tasks that are difficult or impossible through the manipulation of the hard copy version; a user can undertake full-text word searches, simultaneous searches for segments indexed under more than one term, automated cut and paste editing, print on demand production, content analysis through word counts, and more. Transfer of information electronically increases timeliness, and has no geographic limitations.

There are several other criteria that can be applied to compare dissemination formats, such as: timeliness, comprehensiveness, searchability, ease of use, user support required, archivability, flexibility, and stability of the technology. The differences in accessing congressional information in different formats can be better appreciated when these criteria are applied to bill status information, as discussed below for illustrative criteria.

- **Timeliness**: Timeliness is the most important characteristic for consideration of bill status information. For the vast majority of users, bill status information has a relatively short "shelf life." For example, delayed knowledge of when legislation passes through crucial stages (e.g., reporting from the full committee) is no better than complete lack of information. Online formats permit access to up-to-date information whereas printed formats typically provide the information on a much less frequent (e.g., weekly or even annual) basis. CD-ROM potentially falls somewhere in between.
- **Comprehensiveness**: Comprehensiveness is important in order to retrospectively analyze previous related bills and to track fully the history and status of current legislation. The cost of online formats may limit its historical completeness; CD-ROM may offer the most complete and cost-effective coverage.
- **Searchability**: The more specific a searcher's interests, the more important the ability to search for particular bills and sections of bills. Online systems and CD-ROMs clearly enhance the ability to search for specific legislation or topics of interest.
- **Archivability**: Historical bill status information is of interest when analyzing the record of prior legislative activity. Microform and CD-ROM appear to be best suited for archival purposes.
- **Flexibility**: The flexibility of combining bill status information in different ways can be important, (e.g., matching topics and sponsors). Online and CD-ROM offer more flexibility to the extent this capability is needed.
- **Stability of the technology**: The technology for both printed and online formats is stable. CD-ROM technology is still changing rapidly, although standards on readers and disks protect to some degree against technological change.

As with bill status information, access to information in the *Congressional Record* is improved for the user when employing electronic information technologies and especially online services. Access to committee reports, hearings, and prints typically is less time sensitive, and CD-ROM may be particularly helpful in ensuring the **availability** and **indexing** of these materials.

The GAO Survey of Federal Information Users found that, for example, depository libraries already make considerable use of congressional information, primarily in paper format, with some microfiche and online access (the latter via private vendors). As shown in Table 8-4, the depository libraries desire to dramatically increase their use of online and compact optical disk formats, while reducing use of paper modestly and microfiche substantially. More specifically, the majority of depository libraries responded that an online *Congressional Record* and online committee calendar and bill status would be useful or greatly useful, as summarized in Table 8-5. CD-ROM format was assessed as somewhat less useful than online for these types of congressional information, but the majority of depository libraries re-

Table 8-4.—Library Use of Congressional Information[a] by Format, Currently and in Next 3 Years

Library group/Selected formats	Number of libraries responding		Net change	
	Currently use	Desire to use in next 3 years	Number	Percent
Regional depository libraries				
Paper	46	41	−5	−12
Microfilm	10	3	−7	−70
Microfiche	46	40	−6	−15
Electronic mail or bulletin board	1	6	+5	+500
Online data base	14	24	+10	+71
Magnetic tape	1	3	+2	+200
Floppy disk	2	2	—	—
Compact optical disk	3	23	+20	+600
Selective depository libraries				
Paper	302	262	−40	−13
Microfilm	53	23	−30	−57
Microfiche	302	248	−54	−18
Electronic mail or bulletin board	0	13	+13	+
Online data base	61	144	+83	+136
Magnetic tape	0	1	+1	+
Floppy disk	0	31	+31	+
Compact optical disk	2	112	+110	+5,500
Nondepository libraries				
Paper	99	90	−9	−9
Microfilm	8	11	+3	+38
Microfiche	31	41	+10	+32
Electronic mail or bulletin board	0	3	+3	+
Online data base	13	36	+23	+177
Magnetic tape	0			
Floppy disk	0	10	+10	+
Compact optical disk	0	21	+21	+

[a] Defined as *Congressional Record*, Committee hearings and reports, and bills.

SOURCE: GAO Survey of Federal Information Users, 1988.

Table 8-5.—Library Assessment of Usefulness of Congressional Information in Electronic Formats

Library group/information product	Number of libraries responding				
	Greatly useful	Useful	Moderately useful	Somewhat useful	Little or no
Regional depository libraries					
Congressional Record					
Online	20	13	9	2	2
CD-ROM	22	13	5	3	2
Committee calendar and bill status					
Online	30	8	6	1	1
CD-ROM	17	14	6	4	4
Selective depository libraries					
Congressional Record					
Online	109	87	68	58	33
CD-ROM	95	103	57	65	36
Committee calendar and bill status					
Online	133	65	46	63	49
CD-ROM	80	66	55	77	76
Non depository libraries					
Congressional Record					
Online	25	21	36	39	66
CD-ROM	18	30	27	32	78
Committee calendar and bill status					
Online	26	19	29	33	79
CD-ROM	15	19	27	36	85

SOURCE: GAO Survey of Federal Information Users, 1988.

sponding felt that the CD-ROM format would still be at least moderately useful. Overall, the nondepository libraries assessed electronic formats as less useful than did the depositories, but the majority of nondepository respondents still rated electronic formats as at least somewhat useful.

In sum, electronic formats do permit enhanced access to a variety of congressional information, as reflected in the desire of the library community (and especially the depositories) to increase use of electronic formats.

Congressional Responsibility for Electronic Access

Congress has a long and valued tradition as an open political institution, sharing its information with a wide range of groups and individuals. Public access to congressional information is a dynamic concept and dependent upon a number of avenues of dissemination using various technologies. The use of electronic information technologies enhances congressional operations but at the same time produces some inequities in public access to congressional information. As more electronic technologies are incorporated into congressional processes, Congress will find it necessary to consider what level of public access to congressional information in electronic formats is desirable.

The debate concerning congressional information is no different than that with other government information. The debate is focused on the level of and type or format (paper, microfiche, and/or electronic) of public access. Some argue that as long as paper and microfiche documents are available to the public, then a sufficient level of access is permitted. In contrast, others contend that characteristics of the electronic media, for example, search and retrieval capabilities and timeliness, are so powerful that lack of comparable access to these formats constitutes inequitable access to congressional information. In this view, failure to provide comparable access to these products will exacerbate the gap between the information "haves and have nots." The arguments as put forth by those advocating a more active congressional role in the dissemination of congressional information and those supporting a more limited congressional role are presented below.

If one accepts the need for Congress to insure equitable access to congressional information in electronic formats, then the debate shifts to how equitable access should be provided. A key question concerns the role of the private sector. Private vendors have suggested that the most cost-effective way to provide access would be for Congress to contract with vendors, presumably on a competitive basis, for bulk rate online services made available to, for example, depository libraries. The Senate currently has a bulk rate contract with Legi-Slate for online congressional information.

On the other hand, Congress could offer its own online information services (e.g., via HIS and/ or GPO) to the depositories libraries and even the broader public. Advocates argue that a direct congressional role would help guarantee the accuracy and continuity of the information provided, would ensure at least a minimum level of electronic access to the general public, and would be cost-effective by utilizing systems already developed for internal congressional use.

Private vendors argue that such a congressional role would duplicate private offerings, be a wasteful use of public funds, unfairly compete with commercial enterprise, and possibly result in excessive reliance on Congress as the source of congressional information with the attendant potential for manipulation and control of information flow. However, at the same time, vendors point out that their services are state-of-the-art and that it is unlikely that HIS or GPO would catch up soon or ever. If true, then it would seem rather unlikely that HIS or GPO offerings would be very competitive with private sector services. Perhaps more likely, Congress would itself provide a basic level of subsidized, low cost electronic access, and vendors would provide highly enhanced access to those who need and can afford to pay for such services. Even here, Congress could negotiate bulk rate contracts with vendors to the extent highly enhanced service was needed for congressional and/or depository library users.

In considering the issue of public access to congressional and, in fact, all government information, three potentially competing goals impinge on the discussion. These goals relate to *efficiency*, *equity*, and *cost*. The desire to increase the efficiency of producing congressional information and also to make it more usable by Congress has led to extensive internal applications of and investment in information technology (which will continue to change and improve), and this, in turn, has resulted in unequal access to congressional information by the public. For example, with the development of the online capabilities for bill status information, Congress made a clear choice in favor of an electronic format in response to legislative information needs and demands. However, the production and distribution of congressional information involves significant expense, and Congress must balance the need for subsidized public access to congressional information against these production and dissemination costs.

The GAO survey found that libraries, perhaps typical of many public users, are willing to pay only modest amounts for electronic formats. As shown in Table 8-6, relatively few libraries are willing to pay more than about $25 per hour for online congressional information or about $50 per CD-ROM. Consideration by Congress of possible new dissemination techniques in concert with current methods (e.g. the depository library program) will affect future public access to congressional information and ultimately the degree to which the public is an active participant in the political process. In many respects, the resolution of these issues may be just as significant as

Table 8-6.—Library Willingness to Pay for Congressional Information in Electronic Formats, Maximum Acceptable Charge

Information product/library group	Number of libraries willing to pay $1-$9 per hour	$10-$24 per hour	$25-$49 per hour	$50-$99 per hour	$100+ per hour
***Congressional Record* online**					
Regional depository libraries	16	8	11	—	2
Selective depository libraries	98	81	48	15	1
Nondepository libraries	56	16	15	9	1
Committee calendar/bill status online					
Regional depository libraries	14	10	8	2	1
Selective depository libraries	110	66	43	13	2
Nondepository libraries	51	17	13	5	1

	Willing to pay $1-$19 per CD-ROM	$20-$49 per CD-ROM	$50-$199 per CD-ROM	$200-$499 per CD-ROM	$500-$999 per CD-ROM	$1000+ per CD-ROM
***Congressional Record* CD-ROM**						
Regional depository libraries	17	12	3	—	1	1
Selective depository libraries	119	71	22	6	1	1
Nondepository libraries	55	24	4	1	—	1
Committee calendar/bill status CD-ROM						
Regional depository libraries	20	10	1	—	1	1
Selective depository libraries	141	41	14	4	1	1
Nondepository libraries	59	13	3	1	—	1

[a] Excludes "do not know" responses (about 50 Percent) and "not willing to pay anything" (about 1 percent).

SOURCE: GAO Survey of Federal Information Users, 1988.

prior decisions on radio and television coverage of congressional proceedings.

Need for an Index to Congressional Information.

A vast amount of information is developed to support congressional operations. This information, as described previously, is created and disseminated in a combination of paper, microfiche, and electronic formats. Most of this information is available to the public, though not always in the same format as it is available to Congress. There is no central government produced index or catalog of congressional publications. Some items for sale at GPO are listed in the *GPO Publications Reference File* (in microfiche or on-line via DIALOG) and in the GPO *Monthly Catalog of United States Publications* (in hard copy or online from a number of vendors). There are also private sector indexing products available for a fee.

Several channels of access to congressional materials are available to the public, and how one chooses to access congressional information can depend upon the information needed, the skill level of the requestor, the financial resources of the requestor, and the geographic location, and personal or political contacts of the requestor. There is also no common dissemination policy employed by congressional offices and support offices. The introduction of electronic media to congressional operations presents Congress with the opportunity to improve public access to congressional materials, and this improvement could be effected, in part, through better tracking and indexing of congressional information. If Congress determines that an index is needed to facilitate improved access to congressional information, then Congress could authorize one (or more) of its offices to create an index, or could contract with a private or not-for-profit vendor for such service.

Role of GPO

As described in chapter 4, "Alternative Futures for GPO," GPO already uses electronic photocomposition for many types of congressional documents or significant portions of these materials. As a result, congressional documents originate in electronic format, yet are disseminated in a printed format. This shift in GPO's production technologies presents Congress with the opportunity to disseminate its information in printed and/or electronic formats.

There are a number of trends and issues considered throughout this report which relate to the role of GPO. First, as described in chapters 2, 3, and 4, and in this chapter, the Federal Government as a whole is increasingly adopting information technologies in support of on-going programs and agency missions. Second, the hard copy or printed version of a document (if it still is printed) becomes, increasingly, a byproduct of the electronic publishing process. Third, there is no common information dissemination policy within the executive branch and Congress which specifies how government information is to be disseminated in other than hard copy or microfiche format (see ch. 11 for a discussion of policy issues). Fourth, GPO is a primary avenue for dissemination of government (including congressional) information to the public through the depository library program and SupDocs, and there is a debate as to which electronic products to disseminate and how.

Some electronic databases created in support of the printing process (e.g. for the *Congressional Record*) are already for sale by SupDocs. This practice is consistent with the sale of traditional hard copy or microfiche products in that GPO is providing to the public another avenue and format for dissemination of government information; this practice could be extended to a wide range of congressional information in electronic formats. Some members of the information industry have expressed concern about the potential for competition with private enterprise if the GPO role in electronic information expands. The Information Industry Association has previously taken the position that the "government should only provide those information products and services which are essential to society's wellbeing and which are not, and cannot be, provided by the private sector".[10]

GPO's role in electronic media has already changed and is likely to change further, if only because GPO's primary client, Congress, is requesting products in electronic formats. In providing electronic formats to Congress, however, GPO is positioned to more actively participate in disseminating electronic formats to the public at large. The previous discussion of congressional responsibility for electronic access and the role of the private sector is relevant here. Congress is in a unique position to assist GPO in defining its responsibilities with respect to congressional information dissemination in an electronic age.

Need for Congressional Coordination

Congress invests over $100 million annually in automation activities, and this figure has increased steadily since the 1970s.[11] This investment in information technologies has been made by Congress in response to legislative needs and demands, and to technological opportunities. Recognizing the size and nature of this investment, Congress established the Policy Coordination Group (PCG) in the late 1970s to "coordinate the development of technology-supported information systems during the present and succeeding Congresses."[12] This group's actions were successful, but, recently, its coordinating efforts have diminished. Given the importance and complexity of the congressional information technology activities, Congress may wish to consider or examine its current automation practices, including information dissemination activities, evaluate the current and anticipated information needs of the legislative branch, and possibly establish new or revised coordination mechanisms.

The 1987 CRS report, "The Legislator as User of Information Technology," describes many of the resources available to Congress. For example, it is estimated that there are 5,000 computer terminals connected to the Senate computer support system and between 3,500 to 4,000 terminals within the House of Representatives. This does not include terminals and related equipment supporting other congressional offices. In the Senate, the Committee on Rules and Administration establishes overall policy for computer related operations, and the Committee has supported and developed a combination of four systems to address Senate automation and information requirements. The systems serve different office and legislative functions, and included in this resource base is the ability to access commercial online information systems. In the House, the Committee on House Administration and its Subcommittee on Office Systems determine House information policies and practices, and the House Information Systems (HIS) is responsible for information systems planning and operations. For example, HIS operates the Members Information System (M.I.N.) which includes newswire services, information services such as LEGIS, government statistics, the *Congressional Record* in full text, federal funding files, and administrative services such as electronic mail, scheduling information, and the like.

The Congressional support offices—CBO, CRS, the Library of Congress, GAO, OTA, and GPO—are all in different stages of automation, each with differing future plans and goals for incorporating electronic media within their programs. Appropriate use of electronic information systems permits these offices to improve their operations, and hence their service to Congress, but, also, increases the amount and types of possible interactions with other institutions and the options for information dissemination to the public.

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[10] Information Industry Association, "Public Policy Activities of the Information Industry Association," June 1987, p. 26.

[11] Congressional Research Service, "The Legislator as User of Information Technology," Dec. 28, 1987, p. 3.

[12] Ibid., p. 18.

The expanding use of electronic dissemination may necessitate that Congress review, in particular, policies on public dissemination of support agency reports and materials. As noted earlier, GAO reports are publicly available directly from GAO with the first five copies free to any requestor. OTA reports are publicly available but, for most requestors, via the GPO sales program and at the established sales price and sometimes via private vendors who reprint OTA documents. OTA one-page briefs and summary reports are available free to the public. CRS reports are available free to all member offices, and to the public through these offices at the discretion of members. Only about one-tenth of CRS reports are available directly to the public. The dissemination of other support agency documents (e.g., GAO testimony, OTA staff papers, CRS issue briefs) is even more variable. Congress may wish to consider revisions to existing policies to help ensure more equitable public access to support agency materials, including the possibility of consolidated indexing and more consistent approaches to pricing and availability.

Expanding electronic interactions will also influence and could change the nature of some congressional operations. The cooperative program between the LOC and the Research Libraries Group is illustrative. The Library's Linked Systems Project (LSP) enables eight other libraries to input (online) cataloging information into the LOC's computer. And work is currently underway which will permit the exchange of bibliographic data from computer to computer using the LSP so that, when the data is transmitted to the LOC, it can also be redistributed to other bibliographic utilities. The role of the LOC in the future, as it is seen by the new Librarian, James H. Billington, fully employs the electronic technologies:

> By imaginatively using new technologies, for instance, we might aspire to share by the year 2000 much of the substantive content and not merely the descriptive catalog of this remarkable national collection with citizens and students directly in their local communities. Using new technologies boldly may enable us to become less preoccupied with the means and freer to pursue the ends of enhancing the direct interaction between people and ideas within and beyond the Library.[13]

In sum, the integration of information technologies into congressional operations is changing the nature of congressional processes and the possibilities for enhanced public access to information created, generated, and disseminated by Congress. There is a window of opportunity for Congress to examine the congressional information infrastructure (including House, Senate, and support offices) in light of changing technology and user needs, and to consider new or alternative ways to harness the technology to strengthen congressional information dissemination and more fully realize the goal of public access.

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[13] U.S. Congress, Senate, Committee on Rules and Administration. Confirmation Hearings of James Billington as Librarian of Congress, 100th Cong., 1st sess., July 14, 1987.

Chapter 9

The Freedom of Information Act in an Electronic Age

Photo credit: Mark Mangold, Bureau of the Census

Mainframe area, 1986, Bureau of the Census

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Chapter 9

The Freedom of Information Act in an Electronic Age

SUMMARY

When the Freedom of Information Act (FOIA) was passed in 1966, Federal Government records were stored primarily in paper form; the act makes no mention of computer records. Since 1966, the installation and use of computer systems by Federal agencies has proceeded at a dramatic pace. Agency regulations and judicial interpretations have generally supported the treatment of computer tapes and other non-paper media (such as motion pictures, video, and audiotapes) as agency records under FOIA. However, significant unresolved issues warrant congressional attention.

For example, the case law as applied to paper information establishes that FOIA does not require agencies to create new records in fulfilling requests. When additional programming is required to extract information from computer systems, agencies and courts have sometimes held that such programming would be analogous to record creation, and therefore would not be a required part of the FOIA "search" process. In the electronic age, however, some degree of reprogramming or program modification may be essential to obtain access to electronic information.

Another gray area involves defining a "reasonable effort" on the part of the government in searching for records responsive to a FOIA request. In the computer context, the programming/no programming distinction has begun to detach decisions about "reasonableness" from considerations of effort. This is incongruous with tradition, as significant expenditures of effort continue to be involved in manual FOIA searches. Retrieval of paper documents may involve extensive tracking, communication with various bureaus, consolidation of disparate files, and substantial hand deletions of exempted materials. As computer capabilities for searching, segregating, and consolidating of data become increasingly efficient and cost-effective, computer searches could be broadened and public access enhanced. Agencies may need to focus on designing new ways to respond more readily to FOIA requests for computer records.

Another issue is whether and under what conditions the advantages of electronic formats are such that providing electronic access should be guaranteed. Although the case law and the FOIA fee quidelines have established that computer-stored information is subject to FOIA, requesters are not guaranteed access to the information in formats other than paper. If large quantities of data could be more effectively utilized with the flexibility offered by magnetic tapes, disks, or online retrieval, access to these electronic media may be important.

In several FOIA cases, the courts have expressed a need for Congress to clarify the gray areas left open by the statute in its application to electronic information. In developing and considering possible amendments to FOIA, it is important to understand the types and nature of emerging computer-related problems. It is also important to consider new developments in computer and database technology that could alleviate some of these problems in the future. A synopsis of the issues is presented below:

- **Electronic information technologies are obscuring the boundary between record and nonrecord material.** As electronic databases become more sophisticated, they resemble information "pools" rather than discrete records. For example, relational database technology allows data elements from different pathways or "fields" to be connected to one another in nonlinear com-

binations. The parallels to paper records are becoming more remote.

- **Computers are facilitating faster and more complex searches, thereby encouraging a broader definition of a "reasonable" search.** Given computer capabilities for expedited searching, segregating, and consolidating of data, the definition of a "reasonable" search may need to be broadened.
- **Electronic FOIA requests can be incompatible with the ways agencies collect and organize information.** Although this problem also applies to FOIA requests for paper documents, computerized information management systems are aggravating the issue as they are relatively inflexible, with limited capacity to respond to inquiries in an *ad hoc* fashion. Evolving technologies such as relational databases and hypertext could provide some solutions in the future.
- **Computer searching raises new staffing and budgetary problems, as well as opportunities for Federal agencies.** Most agencies have no computer programmers assigned to FOIA implementation. Requests for computerized records are generally given to personnel hired to operate internal information management systems. Agency use of electronic technologies that would help administrative staff retrieve computerized information could ultimately enhance public access to computer records. These technologies include preprogrammed utility software, front-end systems with natural query languages, expert systems, and optical disks.
- **Federal agencies are using information products whose status is unclear under FOIA.** The status of computer programs (including computerized indexes, codes, and directories) is unclear, as is that of integrated software and database packages. Electronic mail, quickly becoming a major mode of interdepartmental communication, presents additional questions for FOIA.
- **Paper printouts of electronic information may not satisfy public access needs.** Although the case law has established that computerized information is subject to FOIA, agencies are not required to deliver the information in machine-readable form. The option of encouraging or requiring agencies to provide alternative electronic formats— such as magnetic tape, floppy disk, optical disk, and online access—warrants consideration.

In resolving these issues, Congress may need to reconsider the purposes and goals of FOIA. If new procedures need to be instituted for an electronic FOIA, the policies behind the procedures should be evaluated and clarified. Computer records today bear few similarities to the paper records of 1966. New database technologies have begun to raise questions about whether computer-stored information can even be conceptualized as discrete records.

For the 1990s and beyond, Congress may need to decide whether the FOIA should continue to be viewed as an "access to records" statute, or whether it should be perceived more broadly, as an "access to information" statute. This is not to suggest that public access to computer-stored government information should be unlimited; access must be balanced against economic and personnel constraints of Federal agencies. However, due to the explosive growth in electronic information storage, processing, and transmission by the Federal Government, traditional views about records and searches may need to be modified to ensure even basic access to computerized public information.

The case law in many areas is too limited, conflicting, or vague to give consistent direction to agencies and courts. Even in those areas where the case law is clear, variation in agency practice suggests the need for greater statutory specificity. If Congress wishes to maintain the integrity of FOIA in an electronic environment, the goals of the statute need to be reassessed and statutory amendment pursued.

INTRODUCTION

The passage of the Freedom of Information Act (FOIA)[1] in 1966 eliminated the ambiguous public information provisions of the Administrative Procedures Act,[2] and shifted the burden of proof from the public to Federal agencies with respect to the withholding of Federal information from public view. The act not only created a "clear right" of access to government information for the press and public, but also made that right enforceable.[3] The purpose of the act was to establish a "general philosophy of full agency disclosure unless information is exempt under delineated language, and to provide a court procedure by which citizens and the press may obtain information wrongly withheld."[4] In signing the bill into law, President Johnson articulated the spirit behind the legislation: "I signed this measure with a deep sense of pride that the United States is an open society in which the people's right to know is cherished and guarded."[5]

In the years following the passage of FOIA, there has been substantial growth in Federal Government use of electronic information systems. Estimates indicate that, when FOIA was passed in 1966, about 3,000 mainframe computers had been installed by Federal agencies; microcomputers were not yet in use.[6] Recent reports indicate that, by 1986, approximately 25,000 mainframes and over 125,000 microcomputers were in place, representing a dramatic increase over a 20-year period.[7] The use of electronic mail and other electronic information systems has also proliferated. For example, according to a 1986 Office of Technology Assessment survey, 97 of 134 Federal agencies and agency components responding reported the use of electronic mail.[8] The results of the 1987 GAO survey summarized in chapter 2 indicate significant and growing Federal agency use of electronic technologies and formats.

When a "paper statute" is applied in an era of electronic information, its original ideals may become more difficult to carry out. Drawing analogies in the courts between paper documents and electronic information is often difficult. Evolving problems in interpreting FOIA could mean that new electronic technologies may serve as barriers to, rather than facilitators of, information disclosure under the act.

This chapter draws upon the existing body of FOIA case law addressing electronic information, and presents those FOIA cases involving traditional paper records that have served as precedents for decisions involving computer records. In most instances, cases are presented chronologically, to provide an evolutionary perspective on the lines of reasoning relevant to issues involving computerized records. Other sources of information that may help clarify ongoing debates, such as legislative history and agency practice, are included.

Finally, the chapter provides an analysis of trends in computer and database technology that raise additional questions about the applicability of traditional interpretations of FOIA to current Federal information practices.

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[1] 5 U.S.C. sec. 552.

[2] 60 Stat. 238 (1946); 5 U.S.C. sec. 1002 (1964).

[3] Harold L. Cross, quoted in the FOIA Source Book, U.S. Congress, Senate Committee on the Judiciary, Subcommittee on Administrative Practice and Procedure, 93rd Cong., 2d. sess., 1974.

[4] U.S. Congress, Senate Committee on the Judiciary, Subcommittee on Administrative Practice and Procedure, *Freedom of Information, Hearings on S. 1663*, 88th Cong., 1st sess., 1964.

[5] U.S. Senate, FOIA Source Book, op. cit., 1974.

[6] Martha Mulford Gray, U.S. Department of Commerce, National Bureau of Standards, Institute for Computer Sciences and Technology, *Computers in the Federal Government: A Compilation of Statistics—1978*, N.B.S. Special Publication 500-46 (April 1979).

[7] U.S. General Services Administration, Information Resources Management Service, *Managing End User Computing in the Federal Government*, No. 2, September 1986.

[8] U.S. Congress, Office of Technology Assessment, *Federal Government Information Technology: Management, Security, Congressional Oversight*, OTA-CIT-297 (Washington, DC: U.S. Government Printing Office, February 1986).

APPLICABILITY OF FOIA TO ELECTRONIC MEDIA

Although the term "records" is used throughout the text of FOIA,[9] it is not defined. Absent statutory reference, application of FOIA to computer tapes and other nonpaper media is determined by agency practice or on a case-by-case basis in the courts. To date, both agency practice and the case law generally support the treatment of computerized information as "records" under FOIA, although agencies are not necessarily required to provide the information in machine-readable form. In certain commonly-occurring cases, the status of computerized information still remains problematic. For example, in instances where computer records require insertion of codes or some form of additional programming to be retrieved from computer systems, agencies and courts have sometimes designated these efforts to be supplemental to the required FOIA "search" process.

According to the following decisions, the term "records," at least in principle, should be applied to computerized information and other nonpaper media, including motion pictures, audio recordings, and videotapes.

Computerized Information

The history of discussion of computerized FOIA records by Federal courts began in 1979, in the U.S. Court of Appeals for the Ninth Circuit. In *Long* v. *Internal Revenue Service*,[10] the court vacated and remanded a district court decision that had denied a request for electronic information compiled by the IRS in its "taxpayer compliance measurement program." Speaking for the majority, Judge Kennedy stated:

> . . . we dispose at the outset of any contention that computer tapes are not generally within the FOIA. The district court apparently determines that the term "records," as used in the Act, does not include computer tapes. This conclusion, however, is quite at odds with the purpose and history of the statute.

Kennedy relied upon the Senate Report accompanying the 1974 amendments to FOIA for its consideration of special problems of computer records in the context of search and copying fees.[11] In addition, he cited the Treasury Department's FOIA regulations which "make explicit provision for disclosure of 'records maintained in computerized form',"[12] and a 1975 opinion by the U.S. District Court for the Northern District of California that had affirmed the accessibility of motion pictures under FOIA.[13]

Judge Kennedy concluded: "In view of the common, widespread use of computers by government agencies for information storage and processing, any interpretation of the FOIA which limits its application to conventional written documents contradicts the 'general philosophy of full agency disclosure' which Congress intended to establish.[14] We conclude that FOIA applies to computer tapes to the same extent it applies to any other documents."[15]

The United States Supreme Court addressed the issue of computerized records in 1980. In *Forsham* v. *Harris*,[16] the Court referred to the Records Disposal Act[17] to arrive at a definition of agency records under FOIA. In delivering the opinion of the Court, Justice Rehnquist cited the Attorney General's 1976 Memorandum on the FOIA for its conclusion that Congress intended the Records Act definition to apply to FOIA:

> . . . although Congress has supplied no definition of agency records in the FOIA, it has formulated a definition in other Acts. The Records Disposal Act, in effect at the time Congress enacted the FOIA, provided a threshhold requirement for agency records: "records in-

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[9] 5 U.S.C. sec. 552.

[10] 596 F.2d 362 (9th Cir. 1979).

[11] S. Rep. No. 854, 93rd Cong. 2d sess. 12 (1974), cert. denied, 446 U.S. 917 (1980).

[12] 31 C.F.R. ssl.5(f) & 1.6(g)(3)(ii)(1977).

[13] *Save the Dolphins* v. *U.S. Department of Commerce*, 404 F. Supp. 407, 410-411 (N.D. Cal. 1975).

[14] S. Rep. No. 813, 89th Cong. 1st sess. 3 (1965).

[15] 596 F.2d 362, 365 (9th Cir. 1979).

[16] 445 U.S. 169, 186 (1980).

[17] 44 U.S.C. sec. 3301.

cluded all books, papers, maps, photographs, *machine readable materials*, or other documentary material, regardless of physical form or characteristics, made or received by an agency of the United States Government under Federal law or in connection with the transaction of public business . . . ." (emphasis added)[18]

A 1982 decision by the U.S. Court of Appeals for the District of Columbia reaffirmed the applicability of FOIA to computerized records. *Yeager* v. *Drug Enforcement Administration*,[19] concerned an appeal to the Drug Enforcement Administration (DEA) for the release of computerized information and the use of computer-facilitated "disclosure avoidance techniques" to conceal exempted private information. Though the appellant's request for "compacting" or concealing personal information was denied, the court acknowledged parallels between manual and computer storage: "Although it is clear that Congress was aware of problems that could arise in the application of the FOIA to computer-stored records, the Act itself makes no distinction between records maintained in manual and computer storage systems."[20] The court concluded that:

> It is thus clear that computer-stored records, whether stored in the central processing unit, on magnetic tape or in some other form, are still "records" for the purposes of the FOIA. Although accessing information from computers may involve a somewhat different process than locating and retrieving manually-stored records, these differences may not be used to circumvent the full disclosure policies of the FOIA.[21]

Other Media

A small, yet important, body of case law has established that various other media constitute records under FOIA. These cases have been cited in several decisions concerning computer generated materials.

Motion Pictures

In *Save the Dolphins* v. *U.S. Department of Commerce*,[22] the U.S. District Court for the Northern District of California affirmed that motion pictures constitute records subject to the disclosure requirements of FOIA. The case concerned a nonprofit corporation that sought access to a National Marine Fisheries Service film documenting the incidental killing of dolphins in the nets of commercial tuna fishing boats. In attempting to determine the status of motion pictures under FOIA, the court admitted to a lack of precedent in the area: "The first question is whether the film sought is a 'record' within the meaning of t[illegible] Act (FOIA). The term is not defined in the A[illegible] Neither do existing judicial interpretation[illegible] pear helpful in regard to the precise quest[illegible] here presented."[23] The court was force[illegible] draw on examples from agency practice, [illegible] ing both the "Disposal of Records" chap[illegible] of the Public Printing and Documents Act[illegible] and the General Services Administration definition of agency records, which includes "all books, papers, maps, photographs, or other documentary materials, regardless of physical form or characteristics . . . ."[25] At the time of the case, the Department of Commerce had not yet defined records in its regulations pertaining to FOIA.

The court's decision in *Save the Dolphins* reflected an interest in broad policy goals over narrow "records" definitions:

> The object of the Freedom of Information Act is to make available to the public "information" in the possession of government agencies. The term "records" in common parlance includes various means of storing information for future reference. There does not appear to be any good reason for limiting "records" as used in the Act to written documents. The motion picture film in question was made in order to store the information it now contains; it therefore falls within the definition of "records" in 5 U.S.C. § 552.[26]

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[18] 445 U.S. 169, 186 (1980).

[19] 678 F. 2d. 315 (D.C. Cir. 1982).

[20] Ibid.

[21] Ibid.

[22] 404 F. Supp. 407 (N.D. Cal. 1975).

[23] Ibid.

[24] 44 U.S.C. sec. 3301.

[25] 141 C.F.R. sec. 105-60.104(a).

[26] 404 F. Supp. 407 (N.D. Cal. 1975).

The important conceptual distinction between whether FOIA applies to "records" narrowly defined or to "information" broadly construed recurs throughout the FOIA debate in cases involving computer-generated materials.

Audio Recordings

A 1976 decision by the U.S. District Court for the Southern District of New York, *Mobil Oil Corp.* v. *Federal Trade Commission*[27] has been cited for its implied treatment of audio recordings as FOIA records. The defendant had requested copies of communications between several Federal and State agencies pertaining to aspects of petroleum use. Although the case dealt primarily with the applicability of pertinent FOIA exemptions, the court specified that "all *identifiable* records must be made available to the public on demand unless requested documents fall within one of the Act's nine exemptions." Mobil's request encompassed "all communications including letters, reports or memoranda, and notes, transcripts, or other memorialization of oral communications." During the proceedings, the FTC was ordered by the court to search for any relevant tape recordings and documents. Only after this search was completed did the court attempt to establish whether Mobil's request fell under FOIA exemptions.

Videotape

Murphy v. *F.B.I.*[28], a 1982 decision by the U.S. District Court for the District of Columbia, concerned a New York Congressman's request for ABSCAM videotapes documenting alleged meetings between the Congressman and undercover agents. Although the decision concerned whether or not the tapes constituted investigatory records, subject to the law enforcement exemption of FOIA, the court held that videotapes could be obtained at the conclusion of the law enforcement proceedings: "[V]ideotapes which were exempt from disclosure prior to indictment can be obtained by accused after indictment."[29]

Although *Albright* v. *United States*[30] is essentially a Privacy Act case, the judgment by the U.S. Court of Appeals for the District of Columbia was based on FOIA's inclusion of videotapes as public records. The case concerned the legality of the filming and retention of a potentially damaging videotape by the Department of Health, Education, and Welfare (HEW). The videotape documented a confrontation between HEW employees and their supervisors. The plaintiffs maintained that storing videotapes of displeased employees exercising their First Amendment rights constituted an unfair labor practice and a violation of the Privacy Act. A copy of the videotape had been provided by the agency to the employees pursuant to a FOIA request filed 3 years earlier. The court determined that: "We do not think the fact that the means of storing information in this case was a videotape makes it any less a record for the purposes of the Act." After citing the decision in *Save the Dolphins*[31] concerning motion picture film, the court maintained that: "As long as the tape contains a means of identifying an individual by picture or voice, it falls within the definition of a 'record' under the Privacy Act."[32]

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[27] 406 F. Supp. 305 (S.D.N.Y. 1976).

[28] 490 F. Supp. 1138 (D.C. Cir. 1980).

[29] Ibid.

[30] 631 F.2d 915 (D.C. Cir. 1980).

[31] 404 F. Supp. 407, 410-411 (N.D. Cal. 1975).

[32] 631 F.2d 915, 920 (D.C. Cir. 1980).

DEFINING THE LIMITS OF SEARCHING UNDER FOIA

Traditional Interpretations

Although it has been established that FOIA applies to records on computer tapes that are in government possession at the time of a request, the status of information stored in computers is under current dispute. The arguments turn on the definition of what activities should constitute searching under FOIA, and what activities extend beyond the realm of searching to records creation. The case law, as applied to paper information, establishes that the FOIA does not require agencies to create new records in fulfilling requests. A history of relevant Supreme Court decisions is presented below. The difficulties involved in making analogies between paper and computer-generated materials will be discussed in a subsequent section.

National Labor Relations Board v. *Sears Roebuck,*[33] a 1975 decision by the U.S. Supreme Court, addressed the Labor Board's attempted rejection of a request by Sears for certain Advice and Appeals Memoranda used in litigation proceedings. The Board argued, first, that the memoranda should be exempt from disclosure under FOIA Exemption 7 dealing with law enforcement proceedings. Second, the Board argued that the requirement to generate explanatory material describing "circumstances of the case" was beyond the reach of FOIA. Although the Supreme Court remanded the first objection, it held that describing the "circumstances of the case" constituted the generation of new materials, and was thus unnecessary for FOIA disclosure purposes:

> The Act does not compel agencies to write opinions in cases in which they would not otherwise be required to do so. It only requires disclosure of certain documents which the law requires the agency to prepare or which the agency has decided for its own reasons to create. Thus, insofar as the order of the court requires the agency to create explanatory material, it is baseless.[34]

In *Forsham* v. *Harris,*[35] the Supreme Court addressed the issue of whether materials generated by government contractors and remaining in the possession of contractors could be considered government records and subject to FOIA request. As in *National Labor Relations Board*, this case turned on whether or not the FOIA request would involve the creation of new records. Speaking for the majority, Justice Rehnquist equated records creation with the obtaining of records not previously held by the agency:

> . . . Congress contemplated that an agency must first either create or obtain a record as a prerequisite to its becoming an "agency record" within the meaning of the FOIA. . . .[I]n this context the FOIA applies to records which have been in fact obtained, and not to records which merely could have been obtained.[36]

Justice Brennan, dissenting, denied that government possession was a requirement for determining what constituted a record: "Nothing whatever in the legislative history suggests that Congress meant to allow agencies to insulate important steps in decisionmaking on the basis of the technical niceties of who 'owns' crucial documents." In explaining his dissent, Brennan argued that a "close connection" between the government and the record was sufficient:

> Where the nexus between the agency and the requested information is close, and where the importance of the information to public understanding of the decisions or the operation of the agency is great, I believe the congressional purposes require us to hold that the information sought is an "agency record" within the meaning of FOIA.[37]

Brennan added that if contractor information was not subject to FOIA, the institution of government contracting could ultimately shield public access to information:

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[33] 421 U.S. 132 (1975).

[34] 421 U.S. 132 at 161-162 (1975).

[35] 445 U.S. 169 (1980).

[36] 445 U.S. 169 at 186 (1980).

[37] 445 U.S. 169 (1980).

> Just as the explosion of Federal agencies, which are not directly responsible to the electorate, worked to hide the workings of the Federal Government from voters before enactment of FOIA, the understandable tendency of agencies to rely on nongovernmental grantees to perform myriad projects distances the electorate from important information by one more step. If the records of such organizations, when drawn directly into the regulatory process, are immune from public inspection, then government by secrecy must surely return.[38]

In *Kissinger* v. *Reporters Committee for Freedom of the Press*[39], the Supreme Court once again addressed the issue of whether records outside of government hands at the time of a request were subject to FOIA disclosure. The plaintiff had questioned a journalist's access to transcripts of politically-significant telephone conversations. Originally in government hands, the transcripts had subsequently been donated to a private library prior to the request. In delivering the opinion of the Court, Justice Rehnquist emphasized the distinction between existing records and record production: "When an agency has demonstrated that it has not 'withheld' requested records in violation of the standards established by Congress, the Federal courts have no authority to order the production of such records under the FOIA." Rehnquist cited the legislative history to strengthen his argument:

> Several sources suggest directly that agency possession or control is prerequisite to triggering any duties under the FOIA. In the debates, the Act was described as ensuring "access to the information *possessed* by (government) servants." (emphasis added)[40]

He also referred to FOIA guidelines issued by the Attorney General in 1966 for the use of all Federal departments and agencies in complying with the new statute:

> The guidelines state that FOIA "refers, of course, only to *records in being* in the possession or control of an agency..." [It] imposes no obligation to compile or *procure* a record in response to a request. (emphasis added)[41]

Justice Brennan, concurring and dissenting in part, determined that FOIA contained an implicit mandate for the government to retain those records it had created, but did not contradict Rehnquist's stance on record creation:

> ... FOIA does not compel agencies to write opinions where not otherwise required. FOIA neither compels the Government to conduct research on behalf of private citizens, nor duplicates administrative law requirements of adequate explanation for Government action. ... What the Act does mandate is exposure of the research and explanations which the government has chosen to memorialize; an agency's obligation to *retain* records, therefore, may be inferred from FOIA without contradicting the principle that agencies need not *create* records. (emphasis added)[42]

Although it is clear that agencies are not required to create new records in response to FOIA requests, determining the point at which searching becomes records creation can be difficult. Put another way, the definition of what constitutes a "record" may depend upon the viewpoints of agencies or courts on the purposes and goals of FOIA. These views will influence whether or not records are perceived to be tangible entities, or whether records are defined more broadly, in terms of the information they may provide. The debate about the physical nature of records pervades the FOIA case law addressing paper records, and is highly significant for cases involving computer records. Whether FOIA applies to some notion of a tangible "agency record" or, instead, to "information in the abstract" becomes a crucial distinction in the case of computer records, which may not exist in tangible form unless modified in some way.

In the Supreme Court's decision in *Forsham*[43], Justice Rehnquist embraced a narrow definition of records, stating outright that

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[38] Ibid.

[39] 445 U.S. 136 (1980).

[40] 112 Cong. Rec. 13652 (1966), reprinted in FOIA Source Book, S. Doc. No. 93-82, p. 69 (1974).

[41] Ibid.

[42] 445 U.S. 136 at 152 (1980).

[43] 445 U.S. 169 (1980).

"The FOIA deals with 'agency records', not information in the abstract."[44] In his dissent, Justice Brennan drew upon the legislative history to argue for a broader interpretation of "records" to account for the original purposes of the Act:

> The Court concedes, of course, that the statute itself does not define "agency records." Therefore, out task is to construe the statutory language consistently with the purposes of FOIA . . . FOIA is a broad enactment meant to open the processes of government to public inspection. It reflects a finding that if left to themselves agencies would operate in near secrecy. FOIA was, therefore, enacted to provide access to information to enable "an informed electorate," so "vital to the proper operation of a democracy," to govern itself.[45]

In 1982, the Supreme Court in *F.B.I.* v. *Abramson*,[46] used a broad definition of records to *limit* access to exempted information. The Court addressed the issue of whether information contained in records compiled for law enforcement purposes (and thus subject to Exemption 7 of the FOIA) would lose its exempt status when incorporated into records compiled for purposes other than law enforcement. The U.S. Court of Appeals for the District of Columbia Circuit had used a physical definition of records to conclude that the exempt status would be lost when records were recompiled into a new physical form. According to the Supreme Court, because recompilation of the physical form of the documents would not alter the basic nature of the information, the exempt status should remain. The Court's decision was based on the "equivalence" of the information contained in the two sets of records:

> We are of the view, however, that the statutory language is reasonably construable to protect that part of an otherwise non-exempt compilation which essentially reproduces and is substantially the *equivalent* of all or part of an earlier record made for law enforcement uses. (emphasis added)[47]

In dissenting, Justice Blackmun advocated a narrower definition of records: "I cannot escape the conclusion that the Court has simply substituted the word 'information' for the word 'records' in Exemption 7 (C)." He cited *Forsham*[48] to conclude that FOIA applied to "agency records, not information in the abstract." Justice O'Connor, also dissenting, concluded that the Court was reaching beyond Congressional intent:

> To reach its result, the Court assumes that, through inadvertence or inattention, Congress' pen slipped while amending Exemption 7 in 1974. Proceeding on this basis, the Court helpfully undertakes to rewrite the Exemption, substituting for the statutory phrase "investigatory records compiled for law enforcement purposes" something like "records containing investigatory information originally gathered for law enforcement purposes."[49]

In the Computer Context: The Distinction Between Searching and Programming

Can the distinctions between searching and record creation under FOIA be extended by simple analogy to the computer context? It is clear that, in cases involving paper documents, the FOIA does not require agencies to create new records on behalf of requestors. A fundamental difference between computerized records and hard copy records, however, is that the former may reside within computer systems until they are specifically demanded.

Computerized government records may require the application of codes or even additional programming to be retrieved from host systems in systematic or comprehensible form. By extending analogies from cases involving paper records, the courts are creating distinctions between computer searching and computer programming, maintaining that programming is not required under FOIA, as it is analogous to record creation. As more information becomes machine-readable, the line between record searching and record creation becomes increasingly fine. Also, as Federal agency communication via electronic mail and other electronic vehicles intensifies, government records may have the potential to become "buried" within computer systems.

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[44] Ibid.
[45] S. Rep. No. 813, 89th Cong. 1st sess. 3 (1965).
[46] 456 U.S. 615 (1982).
[47] Ibid.
[48] 445 U.S. 169 at 186 (1980).
[49] 456 U.S. 615 (1982).

The intellectual debate that needs resolution is as follows: in an electronic age, is creating a program to retrieve a document part of the *searching* process, analogous to a manual search, or should it be considered *creation* of a new record (not required for governmental purposes), which, the case law has determined, is *not* required under FOIA? Press groups and various public interest and public data user groups tend to hold the view that creating a program is analogous to the *searching* process, while agencies may respond that creating a program is no different from creating a new document.

The arguments turn on how records are defined. If an agency maintains that FOIA pertains only to "records in being," then any kind of manipulation used to extract data from a system could technically serve as a rationale to withhold information. If some degree of manipulation is required to make a computer record comprehensible or available to the public, then perhaps the "record in being" definition should be avoided. On the other hand, in some cases, distinctions must be drawn between making records available and analyzing or further manipulating data, as FOIA does not compel agencies to assume analytical research functions. Furthermore, FOIA applies only to records created for government purposes, and the manipulation of information may be perceived to be equivalent to the creation of records that are not for government use.

Another gray area, which has become increasingly apparent in the context of online information, is the determination of what constitutes a "reasonable effort" on the part of the government in searching for records responsive to a FOIA request. The legislative history of the FOIA indicates that a description of a requested record is sufficient if it enables "a professional agency employee familiar with the subject area to locate the record with a reasonable amount of effort."[50] How can a "reasonable effort" be defined in an electronic age, when the capabilities for manipulating information become increasingly efficient and cost effective? In the light of electronic developments, the threshold of "reasonableness" warrants re-examination. The issue becomes apparent in the cases presented below, some of which involve requests for computer segregating and compacting of data. According to the case law, when exemptions are involved, FOIA only requires agencies to disclose that information which is "reasonably segregable." The ability to delete personal and trade data electronically could call for a broadening of the domain of requests that are considered reasonable. Congress and the courts may need to abandon some traditional views, and build an entirely new frame of reference for electronic information.

Federal appellate and district courts have begun to address the problems associated with defining the appropriate nature and extent of computer seaching under FOIA. In *Long* v. *IRS*,[51] the U.S. Court of Appeals for the Ninth Circuit vacated and remanded a district court decision that had determined that the process of deleting personal information from a record in order to "sanitize" tax compliance information would involve the creation of a new record. The appeals court determined that the material requested was, in fact, "reasonably segregable" from exempted information, and, therefore did not involve the creation of a new record: "We do not believe, however, that the mere deletion of names, addresses, and social security numbers results in the agency's creating a whole new record."[52]

The *Long* court differentiated the facts of the case from *N.L.R.B.* v. *Sears*:[53]

> Requiring an agency to write an opinion on request is far different, however, from requir-

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[50] H.R. Rep. No. 876, 93rd Cong., 2d sess. 6 (1974), reprinted in 1974 U.S. Code Cong. & Ad. News 6271.

[51] 596 F. 2d. 362 (9th Cir. 1979), cert. denied, 446 U.S. 917 (1980).

[52] Ibid.

[53] 421 U.S. 132, 161-62 (1975).

> ing it to excise a name or social security number from an existing record. . . . [T]he editing required here is not considered an unreasonable burden to place on an agency.[54]

The appeals court in *Long* disagreed with the district court's holding that deletion of identifying information would be prohibitively expensive; the IRS had estimated an editing cost of $160,000. The court explored "... whether the cost and inconvenience to the agency attributable to the editing process can be the sole basis for determining that material is not reasonably segregable." The court cited the legislative history of the 1974 amendments to FOIA dealing with fees to argue that agencies should bear the costs of deletions. The legislative history contains a statement indicating that "fees should not be used for the purpose of discouraging requests for information or as obstacles to disclosure of requested information."[55] The amendments provided that agencies could only charge for costs of search and duplication. The court further cited a Department of the Treasury regulation that stated that "under no circumstances will a fee be charged for . . . deleting exempt matter . . ."[56]

In *Yeager* v. *Drug Enforcement Agency*,[57] the D.C. Circuit Court came to a different conclusion regarding the limits of reasonableness in segregating disclosable data under FOIA. In this case, the requester had asked the Drug Enforcement Agency to "collapse" or "compact" data electronically. Data compaction or "disclosure avoidance techniques" are used to remove sensitive information from statistical materials and involve the expression of specific information in more general terms. Computers have facilitated these types of data manipulations.

The *Yeager* court determined that agencies were not required under FOIA to use disclosure avoidance techniques in fulfilling their duties to release "reasonably segregable," non-exempt portions of records. The test used to determine the breadth of requestable functions was whether the search was "functionally analogous" to a manual search. The Senate report on the 1974 amendments, in the sole reference to computer-stored records, maintained that, "in computerized form, the term 'search' would include services 'functionally analogous' to searches for records maintained in conventional form."[58] The court held that: "although it is clear that Congress was aware of problems that could arise in the application of the FOIA to computerized records, the Act itself makes no distinction between records maintained in manual and computer storage systems." The judge cited holdings in *National Labor Relations Board*,[59] *Forsham*,[60] and *Kissinger*[61] on record creation, and concluded that:

> It is well settled that an agency is not required by FOIA to create a document that does not exist in order to satisfy a request. A requester is entitled only to records that an agency has, in fact, chosen to create and retain. Thus, although an agency is entitled to possess a record, it need not obtain or regain possession of a record in order to satisfy a FOIA request . . . Agencies are not, however, required to commit to paper information that does not exist in some form as an agency "record." Thus, they need not write an opinion or add explanatory material to a document.[62]

The *Yeager* court determined that new capabilities of computers should not result in the expansion of duties imposed on agencies: "The FOIA does not contemplate imposing a greater segregation duty upon agencies that choose to store records in computer than upon agencies that employ manual retrieval systems." The court concluded that Congress did not require any restructuring of the substantive content of records, feasibility and full disclosure notwithstanding:

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[54] 596 F. 2d 362 (9th Cir. 1979).

[55] S. Rep. No. 1200, 93rd Cong. 2d. sess. (1974).

[56] 31 C.F.R. sec. 1.6(a)(1) (1977).

[57] 678 F. 2d 315 (D.C. Cir. 1982).

[58] S. Rep. No. 854, 93rd Cong. 2d. sess. (1974).

[59] 421 U.S. 132, at 161-162 (1975).

[60] 445 U.S. 169, at 186 (1980).

[61] 445 U.S. 136, at 152 (1980).

[62] 678 F 2d at 315 (1982).

> The interpretation suggested by (petitioner) Yeager may be desirable in terms of full disclosure policy and it may be feasible in terms of computer technology; these factors notwithstanding, however, we are not persuaded that Congress intended any manipulation or restructuring of the substantive content of a record when it commanded agencies to "delete" exempt information.[63]

Although *Yeager* rejects segregation duties in this case, it pays lip service to the potential of increased disclosure offered by computers:

> Our treatment of the use of disclosure-avoidance techniques should not be viewed as disapproval of the use of such techniques by agencies. We hold only that the FOIA does not *mandate* their use in determining whether information is "reasonably segregable." The FOIA does not prohibit an agency from releasing information that falls within any of the delineated exemptions. It only provides the agency the *option* of withholding the documents. . . . Agencies that store information in computerized retrieval systems have more flexibility in voluntarily releasing information and should be encourage(d) . . . to process requests for computerized information even if doing so involves performing services which the agencies are *not required to provide* . . . (emphasis added) [64]

That searches for computer records should involve activities which are "functionally analogous" to manual searches is an important concept, one which continues to serve as a cornerstone of debates about the extent of computer searching appropriate to FOIA. The term has been used to support as well as to deny requests for computer searches. However, defining when a computer search is "functionally analogous" to a manual search may be a subjective enterprise; Congress may need to examine the appropriateness of using tests which are based on analogies to paper records to define the limits of computer searches.

In a case recently settled in the U.S. District Court for the District of Columbia, *Public Citizen* v. *Occupational Safety and Health Administration,*[65] a public interest group challenged the comparison of computer programming to new record creation. The case involved an attempt by Public Citizen to conduct a survey of OSHA's enforcement of policies of employee notification about workplace hazards. Public Citizen first approached a regional office which claimed that a search of paper records would be unduly burdensome, and suggested that the enforcement information was currently available on a company-by-company basis in OSHA's computerized "Integrated Data Management System" in its Office of Management Data Systems. When Public Citizen offered its list of companies to that office, OSHA maintained that, although the companies were in its database, computer reprogramming would be required to satisfy the request. As new programming would constitute the creation of a new record, the request did not fall under FOIA, and Public Citizen therefore would not be entitled to a fee waiver.

Public Citizen's lawsuit challenged this contention, claiming that the retrieval procedures were analogous to searching, not record creation. According to Public Citizen, OSHA's assessment of the full costs of computer time would terminate Public Citizen's inquiry. The public interest group also pointed out that OSHA had supplied similar computer printouts in the past to requesters free of charge.

Once the suit was initiated, OSHA claimed that it had increased its computer capabilities to the extent that the appropriate technology was available to conduct the search without additional programming. The case was settled when the agency agreed to produce the information and grant a FOIA fee waiver to the public interest group.

Public Citizen illustrates a problem that recurs in legal questions involving new technologies—a lack of technological literacy among lawyers, judges and litigants. In the case of FOIA, it may be difficult or impossible for non-agency personnel to know whether technological explanations are being used honestly or arbitrarily to circumvent information disclosure. This issue is connected to that of determining costs for searches. If requesters cannot know what types of operations are genuinely required to fulfill requests, they have little way of knowing whether assessed costs are accurate.

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[63] Ibid.

[64] S. Rep. No. 854, 93rd Cong., 2d sess. 12 (1974).

[65] Civil Action No. 86-07-05 (705 D.C. District Court).

In a recent decision by the U.S. District Court for the Eastern District of Pennsylvania, *Clarke* v. *Treasury*,[66] the plaintiff sought compiled information from the bond records of certain "Flower Bond" holders. The court determined here that a new computer program would need to be created to extract the information requested. The court drew upon *Forsham*[67] and *Kissinger*[68] to hold that: "while an agency may be required to produce records that do exist, it is not required to make them," and cited the Department of the Treasury's regulation that provided that: "[t]here is no requirement that records be created or data processed in a format other than that required for governmental purposes in order to comply with a request for records."[69]

In a case decided by the U.S. District Court for the District of Columbia, *Kele* v. *U.S. Parole Commission*,[70] the petitioner requested statistical information on convicted murderers receiving early parole. The Commission maintained that the information could not be retrieved without new programming and denied the petitioner's request. Though the petitioner, Kele, insisted that retrieval would involve nothing more than the punching of a few keys on a keyboard, the Department of Justice argued on behalf of the Commission, holding that:

> . . . to go beyond an agency's own existing capabilities to extract data in defining computerized 'records' would constitute a wholesale departure from both existing law and the purposes of the FOIA, to say nothing of the practical ramifications for the government.[71]

In denying Kele's request, the court upheld the Justice Department's view that:

> . . . to hold otherwise by requiring agencies to write computer programs not needed for carrying out agency functions in response to FOIA requests would transform the government into a giant computer research firm captive to the whims of individual requesters at a great public expense.[72]

A recent decision by the Department of Energy's Office of Hearings and Appeals (OHA) may help change the tenor of future debate.[73] The Energy Department determined that reprogramming of computers, in some cases, should be considered appropriate and necessary to the FOIA search process.

The case concerned a request by the National Security Archive (NSA) for a listing of unclassified "limited access documents" available to authorized requesters from the DOE's Office of Scientific and Technical Information (OSTI). Library personnel at OSTI responded that the data existed in a database, but that FOIA did not require OSTI to compile the list, as production of a list from the database would constitute new programming.

The NSA appealed OSTI's determination to the DOE's Office of Hearings and Appeals (OHA). In conferring with OSTI, OHA found that if a "profile" of the requesting party were entered into the computer, the list of reports available to that party could be retrieved. OHA granted NSA's appeal[74] and directed OSTI to contact the NSA to clarify the scope of its request and to inform the NSA of the structure and contents of its database. According to DOE regulations, if the agency holds that a request does not reasonably describe the records sought, agency personnel are required to confer with the requester in an effort to restate the request in a manner that would facilitate compliance.[75] In addition, OSTI was then directed to search its database to provide the list of documents sought by the NSA. The OHA stated in its decision that programming could be considered an appropriate part of a search for FOIA records: "[T]he mere retrieval of information already existing in a database, even if a computer must be programmed to select specified types of data, does not constitute creation of a new record."[76]

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[66] Civil Action No. 84-1873 (E.D. Pa. 1986).

[67] 445 U.S. 186 (1980).

[68] 445 U.S. 136, 152 (1980).

[69] 31 C.F.R. sec. 1.5(a) (1984).

[70] Civil Action No. 85-4058 (D.C. District Court, 1986).

[71] Memorandum of Points and Authorities in support of defendant's motion to dismiss, p. 18.

[72] Ibid., p. 19.

[73] Opinion of Record, Decision and Order, Office of Hearings and Appeals, U.S. Dept. of Commerce, Case No. KFA-0158 (June 1988).

[74] Decision and Order, Office of Hearings and Appeals, U.S. Dept. of Energy, Case No. KFA-0146 (Dec. 18, 1987).

Shortly thereafter, OSTI filed a Motion for Clarification of OHA's decision, maintaining that OHA's statement was overboard and inconsistent with FOIA requirements. In its response, OHA held that, contrary to OSTI's contention, providing a list of documents derived from OSTI's database would not constitute the creation of a new record. According to OHA, agencies may need to manipulate their software to perform FOIA searches, even if those searches are dissimilar from searches normally conducted by agencies for their own purposes:

> We believe, however, that to the extent that OSTI maintains records in a database and already has software that is capable of searching the database, the FOIA requires OSTI to use that software to search the database for the requested records. This is true even if the type of search that must be performed is different from the type normally performed by OSTI. A search of this nature is not, in substance, significantly different from a search of a file cabinet for paper records that are responsive to a request. If the FOIA required anything less it would allow agencies to conceal information from public scrutiny by placing it in computerized form. This would be inconsistent with the FOIA's policy of the fullest possible disclosure.[77]

The OHA specified that there should be limitations upon the work that agencies must undertake under FOIA, as:

> . . . the FOIA does not require agencies to answer questions, generate explanatory material, compile statistical data, or provide any other information that is not already contained in agency records . . . There is also no doubt that agencies are not required to perform calculations, manipulate data, or restructure records in any way pursuant to a FOIA request, since this would constitute the creation of a new record.[78]

However, short of the above exceptions, the OHA held that many types of computerized searches should be considered analogous to those performed by hand:

> While the process may be different, many computer searches are in substance essentially the same as manual searches and involve comparable methods and skills. For example, to search paper records a methodology must be developed and the relevant files or file drawers manually searched for the requested information. Similar methodologies must be developed and used when a computer is instructed to perform the search. A computer search may be electronic in nature, but it is not necessarily any different in essence. It merely uses different tools—the computer and its software—to conduct the search.[79]

The OHA refuted the court's holding in *Clarke* v. *Treasury*,[80] where the agency was not required to undertake programming to provide a simple listing to the requester:

> Under these circumstances, we do not believe that this single district court opinion can be interpreted to mean that agencies can never be required to perform any reprogramming in order to comply with a FOIA request.[81]

The OHA did not attempt to define the extent to which agencies must reprogram their computers in order to respond to FOIA requests, and maintained that it will address this issue in the future on a case-by-case basis:[82]

> The more difficult issue is the *extent to which agencies must search a database* in ord-

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[75] 10 C.F.R. 1004.4 (C)(2).

[76] Op. cit.

[77] Decision and Order, Office of Hearings and Appeals, U.S. Dept. of Energy, Case No. KFA-0158 (May 26, 1988).

[78] Ibid.

[79] Ibid.

[80] Civil Action No. 84-1873 (E.D. Pa. 1986).

[81] U.S. Dept. of Energy, Case No. KFA-0158, op. cit.

[82] Ibid.

er to select those records within the database that are requested pursuant to the FOIA. On this issue, no precise answer can be formulated in the abstract. As noted above, this is an unsettled area of the law and there are few judicial determinations to guide us. Furthermore, an agency's obligation to search its database may depend upon the circumstances presented, including how the database is structured, the capabilities of the agency's computer system and personnel, and the specific information requested."(emphasis added)[83]

Determining the Format of Information Delivered

Although both the case law and the FOIA fee guidelines have established that computer stored information is subject to FOIA, requesters are not guaranteed access to this information in formats other than paper. According to a limited body of case law, once the determination has been made that a FOIA request for computer-stored information is reasonable, an agency is not legally bound to offer the information in any specified format. If a requester does not specify format, the agency will generally provide the information in the least expensive form possible, or in the form most compatible with the agency's current information delivery modes. If the requester does specify format, agencies may accommodate the request, if costs are not unreasonable. Otherwise, the requester will be denied the format, or offered the option of obtaining the specified format at a higher price.

A 1984 decision by the U.S. District Court for the District of Columbia, *Dismukes* v. *Department of the Interior*,[84] addressed the issue of the equivalency of alternative formats. The plaintiff requested a computer tape listing of participants in the Bureau of Land Management's California oil and gas leasing lotteries, in "nine track, 1,600 b.p.i., DOS or unlabeled, IBM compatible formats, with file dumps and file layouts." The Department of the Interior responded that the information was only available on microfiche. The court held that the agency had no obligation under law to satisfy the request on computer tape, and could determine the form in which it would make its records available, providing it had a reasonable argument for not presenting the information in the format requested:

> An agency has no obligation under the FOIA to accommodate a particular requester's preference regarding the format of requested information and, according to FOIA, the agency need only provide responsive, nonexempt information in a "reasonably accessible form."[85]

Although, in this case, computer tape offered the least expensive means of access, the agency system was configured to deliver this type of information on microfiche.

The issue in *Dismukes* was whether the tape and microfiche were *equivalent* media for agency records, such that release of the latter would satisfy a request for the former. To support the decision, the court used the rationale that FOIA applied to information in the abstract rather than to tangible agency records. While this is an argument that recurs throughout FOIA case law, it was used here to limit the specificity of formats, rather than to argue for fuller disclosure.

The *Dismukes* court acknowledged the Supreme Court holding in *FBI* v. *Abramson*,[86] also citing a 1982 case, *Center for National Security Studies* v. *CIA*,[87] where the court rejected the plaintiff's "literal, physical approach to the definition of agency record." The court determined that, if the plaintiff were to strengthen his case, he would need to prove that the decision to release the information on microfiche would diminish his access to the information he sought. The court did allow that, in some cases, formats would *not* be equivalent, as in the case of audiotapes, where written transcripts would not be able to provide the "nuances of inflection which give words added meaning beyond that reproducible on paper." In the case presented, however, the court determined that: "neither plaintiff nor any document in the record suggests that the quantum of information contained in the microfiche varies in any way from that recorded on the computer tape."[88]

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[83] Ibid.

[84] 603 F. Supp. 760 (D.D.C. 1984).

[85] Ibid.

[86] 456 U.S. at 615 (1982).

[87] 577 F. Supp. 584, 589-590 (D.C. District Court, 1984).

NASA has recently appealed a decision by the U.S. District Court for the District of Columbia, in which information contained in audiotapes was determined to convey nuances that made them more valuable than the written transcripts. *New York Times* v. *NASA* [89] concerns a *New York Times* reporter's FOIA request to obtain cockpit voice recordings from the space shuttle, *Challenger*, along with transcripts and digital information. The trial judge ordered disclosure of the tapes. NASA appealed on the grounds that the tapes constituted personal proprietary information (similar to personnel and medical files), and that release of the tapes could create undue suffering for the families of the astronauts. The reporter claimed that, unlike transcripts, the tape recordings conveyed voice inflections and reproduced shuttle background noises that could serve as indicators of technical problems, possibly enhancing future efforts to improve safety. A three-person Circuit Court panel recently affirmed the lower court's decision, and the case awaits a potential appeal by NASA to the full court.

EXPANDING THE LEGAL FRONTIERS: PUBLIC ACCESS TO SOFTWARE AND ONLINE DATABASES

Software

The status of computer software (including indexes, directories, and operating programs and codes) under FOIA is uncertain, and few agencies mention software in their regulations. Agency practice is inconsistent, varying with the function of the software, its commercial potential, and general agency attitudes toward openness. No legal cases clearly address the issue of what classes of software should constitute agency records. Some agencies have suggested that software is a *tool* used to manipulate information rather than a record, while others relinquish software products when requests are perceived to be reasonable. This issue is problematic as some sort of code may be necessary for even the most basic functions, such as producing a printed document from the magnetic media on which the information is stored. It may be difficult or impossible for requesters to know what types of computer operations are involved in the agency's retrieval process, and whether their rights under FOIA are being arbitrarily denied for technical or other reasons.

The issue of whether or not codes and other information needed to extract computerized data are agency records under FOIA was raised by the district court in *Yeager*,[90] and was not resolved on appeal. Conceivably, an agency might deny access to computer codes under FOIA Exemption 2, which covers internal personnel matters and has been construed to absolve the agency from any obligation to produce "trivial" internal information. The appeals court in *Yeager* concurred with the holding of the lower court on the subject of codes: "The district court found that if Yeager had magnetic tapes of computer records, then the codes necessary to read and use the tapes would become more than intra-agency records."[91]

A more liberal view emerged in a 1982 decision by a Florida appellate court, where computer codes were compared to instructions accompanying a written document. In *Seigle* v. *Barry*,[92] the court stated:

> The information in a computer is analogous to information recorded in a code. Where a public record is maintained in such a manner that it can only be interpreted by the use of

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[88] 603 F. Supp. 760 (D.C. District Court, 1984).

[89] Civil Action No. 86-02860 (D.C. District Court, 1986).

[90] 678 F.2d at 315 (D.C. Cir. 1982).

[91] Ibid.

[92] 422 So.2d 63 (Fla. 4 D.C.A. 1982).

a code, then the code book must be furnished to the applicant.[93]

While pre-existing data can be demanded under FOIA, further analysis of data cannot. However, the distinction between record production and data analysis may become blurred in cases involving computer records. If a record is incomprehensible to anyone but the operator of an in-house system, some form of analysis may be required. Also, if a database includes software combined with public information, and the two are not segregable, the status of the software under FOIA can be argued. Conceivably, one fraction of the database could constitute nonreleasable agency information, while the rest of the unit qualified as a "record" by FOIA standards.

While most agencies have failed to mention software explicitly in their FOIA regulations, the Department of Defense (DoD) is an exception. DoD made several explicit references to software in its recent regulations pertaining to fees and fee waivers, in compliance with the FOIA Reform Act of 1986.[94] In specifying those materials which should not constitute records under FOIA, the Department included in its definition of commercially exploitable resources: "Computer software, if not created or used as primary sources of information about organizations, policies, functions, decisions, or procedures of a DoD component." DoD did, however, add that this definition should not include the "underlying data which is processed and produced by such software and which may in some instances be stored with the software." (emphasis added)[95]

Perhaps even more significant is DoD's reference to information stored inside machines. According to the regulations, information stored within a computer "for which there is *no existing computer program or printout*" (emphasis added)[96] would *not* be subject to a FOIA request. When in-house paperwork reduction efforts and the efficacy of computer communications have led to increased use of electronic mail and other electronic systems to relay agency information, this limited definition of "records" could be problematic. Even when information is targeted for public consumption, the growing adoption of "printing on demand" practices should stimulate close examination of relevant regulations.

Online Databases

Given the trend toward cost recovery for Federal agency information products, it seems likely that user fees will continue to help support Federal online database delivery systems. If FOIA requests for copies of certain databases are denied, and online access is priced beyond the means of particular requesters, the Federal Government can be accused of restricting public access to its electronic information. On the other hand, if private vendors or other members of the public are able to obtain copies of Federal databases at nominal prices under FOIA, the ability of these database services to operate in a self-sustaining fashion could be eroded.

The leading case addressing a FOIA request for machine-readable copies of a Federal database is *SDC Development Corp.* v. *Mathews*, a 1976 ruling by the U.S. Court of Appeals for the Ninth Circuit.[97] The case concerned an attempt by a private firm to use FOIA to obtain copies of the extensive MEDLARS bibliographic health database from the National Library of Medicine (NLM). The MEDLARS tapes were available for sale on a subscription basis through the National Technical Information Service (NTIS) for $50,000, with an estimated additional cost of $50,000 for annual data updating. The firm maintained that the database should be relinquished for the cost of search and duplication, presumably much less than the NTIS sales price.

The court held that the library reference materials were not public records, and need not be relinquished under FOIA. Although this case is sometimes cited by agencies to deny the analogy between paper records and computerized records, the fact that NLM's reference materials were stored in a computer databank was inconsequential to the decision. The court used the rationale that applying FOIA here would constitute a conflict between two statutes, in this case FOIA and the National Library of Medicine Act.[98] "When two statutes are capable of coexistence, it is the duty of courts, absent a clearly expressed Congressional intention to the contrary, to regard each as effective."[99] The National Library of Medicine Act, in which Congress established the Library in 1956, authorized the Secretary of Health, Education, and Welfare to charge the public for using services and materials.[100] The court also footnoted the Technical Information Act[101] which directed the Secretary of Commerce to maintain a clearinghouse for scientific and technical information in which "to the fullest extent feasible, each of the services and functions provided shall be self-sustaining or self-liquidating."[102]

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[93] Ibid.

[94] P.L. 99-570, 100 Stat. 3207-49.

[95] 32 C.F.R. Part 286, 1987 (Fed. Reg. vol. 52, No. 132, July 10, 1987).

[96] Ibid.

[97] 542 F. 2d at 1116 (9th Cir. 1976).

The court distinguished here between information *per se* and information delivery systems:

> Congress specifically mandated the agency to prepare this system and hold it as stock in trade for sale to the public. As such the system constitutes a highly valuable commodity. Requiring the agency to make its delivery system available to the appellants at nominal charge would not enhance the information gathering and dissemination function of the agency, but rather would hamper it substantially. Contractual relationships with various organizations, designed to increase the agency's ability to acquire and catalog medical information, would be destroyed if the tapes could be obtained essentially for free . . . The agency is seeking to protect not its information, but rather its system for delivering that information.[103]

The *Mathews* court determined that the MEDLARS material did not constitute an agency record, as it:

> . . . does not directly reflect the structure, operation, or decision-making functions of the agency, and where, as here, the materials are readily disseminated to the public by the agency, the danger of agency secrecy which Congress sought to alleviate is not a consideration.[104]

SDC v. *Mathews* is particularly interesting when observed in the context of the debate over the roles of the public or private sectors in the delivery of public information services. In a committee report on government information dissemination prepared by the House Committee on Government Operations, the *Mathews* court was accused of having "misunderstood the statutory role of NLM, misread the FOIA, and failed to consider the Copyright Act and the significance of the policy against restrictions on dissemination of government information."[105] The decision works both in favor of and against private vendors. On the one hand, the decision supports NLM's charging of fees and its exclusive agreements with private contractors in order to further the agency's public information objectives. On the other hand, to protect the agency's information dissemination mission, the decision prevents other private database vendors from using FOIA as an inexpensive means to obtain marketable electronic data.

A case currently pending in the U.S. District Court for the District of Columbia, *International Computaprint Corp.* v. *U.S. Department of Commerce*[106] raises issues addressed in *Dismukes*[107] as well as *SDC* v. *Mathews.*[108] Computaprint, a private database vendor, requested machine-readable copies of the Patent Office's (PTO) computerized trademark database. PTO denied the request on two grounds. First, because the data was available through alternate means, PTO claimed that it had no obligation to provide machine-readable tapes. Trademark data could be obtained online in PTO's public reading room, as well as on microfiche. Using the line of reasoning in *Dismukes*, the agency maintained that the information content of a record is not affected by its format. Second, PTO responded that the economic value of the tapes excluded them from FOIA.

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[98] 42 U.S.C. 276.
[99] 542 F. 2d at 1116 (9th Cir. 1976).
[100] 42 U.S.C. 276 (c)(2).
[101] 15 U.S.C. sec. 1151-1157.
[102] 542 F. 2d at 1116 (9th Cir. 1976).
[103] 603 F.2d at 1116 (9th Cir. 1976).
[104] Ibid.
[105] *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview*. House Rep. 99-560, 99th Cong. 2d sess. 1986, p. 35.
[106] Civil Action No. 87-1848 D.C. (District Court, 1987).
[107] 603 F. Supp. 760 (D.D.C. 1984).
[108] 542 F. 2d. at 1116 (9th Cir. 1976).

Computaprint maintains that the Patent Office's alternative means of securing trademark information are inadequate. According to Computaprint, the paper records in PTO's reference library are not as accurate as the computerized records—in fact, the agency's original rationale for computerization was the upgrading of its information. During an experimental effort to use the heavily-trafficked computer terminals in the public reference rooms, Computaprint personnel were asked to leave the terminals at one-hour intervals. Computaprint has estimated in its briefs that securing the information through the public reference rooms would take about 8 years. According to Computaprint, the case is not analogous to *SDC* v. *Mathews*, as there are no provisions in PTO's authorizing legislation to make the trademark database self-sustaining.

Complicating the case, a reverse-FOIA action was filed by Thomson and Thomson, the contractor that computerized PTO's files.[109] In a special agreement with PTO, Thomson and Thomson currently receives a copy of the database for commercial use. Thomson and Thomson claims that the records in question represent a "a computer-readable trademark database and search system developed at substantial cost,"[110] and that releasing some of the information to Computaprint, even on microfiche, could reveal proprietary information of submitters. According to Thomson and Thomson, release of machine-readable tapes to Computaprint at nominal costs under FOIA would relieve Computaprint from the capital costs of developing its own database, giving Computaprint an unfair competitive advantage over Thomson and Thomson in the trademark search business. Computaprint has responded that allowing Thomson and Thomson to use the database while restricting other bulk transfers of data from PTO's system is contrary to the mandates of FOIA.

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[109] *Thomson and Thomson* v. *International Computaprint Corp.*, Civil Action No. 88-0839 (D.C. District Court, 1988).
[110] Ibid.

FEE ASSESSMENT AND FEE WAIVERS: CHARGED ISSUES IN AN AGE OF ELECTRONIC INFORMATION

The growth in computerized agency records and the associated escalation in costs of records have heightened public sensitivity to the new Federal standards for fee assessment and fee waivers that were specified in the FOIA Reform Act of 1986.[111] The act gave the Office of Management and Budget the authority to establish fee guidelines, which were issued in 1987 as the Uniform Freedom of Information Act Fee Schedule and Guidelines.[112]

Fees that are assessable under FOIA fall into three categories: 1) review costs—costs associated with the determination of whether the requested documents can be disclosed), 2) search costs—costs associated with retrieving disclosable documents, and 3) reproduction costs.

Under the FOIA amendments of 1974, fees were reduced or waived when the information requested was determined to "benefit the general public."[113] "Benefitting the public" was subsequently construed by agencies to mean that public dissemination was expected. The new standard for applying general fee waivers has been more specifically defined, from "benefitting the public" to "*significantly* increasing the understanding of government activities" (emphasis added).[114]

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[111] P.L. 99-570 (100 Stat. 3207-44).
[112] P.L. 99-570 (Fed. Reg. vol. 52, No. 59, 1987).
[113] P.L. 93-502.

Where there were no distinctions between requesters in the 1974 amendments, the provisions of the FOIA Reform Act specify three categories of requesters that are unconditionally entitled to preferential fee treatment. The news media, educational institutions, and noncommercial scientific institutions are automatically excluded from all but duplication costs. Commercial requesters may be assessed review, search, and duplication costs, while other requesters who do not fall into one of the above four categories may be assessed both search and duplication costs. Outside this schedule, all requesters are entitled to apply for general fee waivers.

Since the 1986 amendments have guaranteed reduced fees for specified groups, they are potentially more generous than the amendments of 1974. However, the new amendments have been highly criticized for their omission of certain groups from the favored categories, particularly libraries and public interest groups. Also, the definition of the specified categories eligible for favorable fee treatment has generated controversy, as the OMB guidelines take a more restrictive view than those put forward by several congressional sponsors of the amendments.

Under the new FOIA fee guidelines, in searches for paper records, noncommercial requesters may not be charged for the first 2 hours of search time or the first 100 pages of information delivered. OMB has determined, however, that 2 hours of computer search time is not analogous to 2 hours of manual search time. Since most computer searches are accomplished in seconds and fractions of seconds, according to OMB, an interpretation of the statutory free search time as an entitlement to require an agency to operate a computer for 2 hours would constitute an unreasonable disruption of an agency's normal automated data processing (ADP) activities. Thus, OMB has developed a formula based on a literal analogy to a manual search, whereby the computer searcher is equated to as a clerical worker undertaking a manual search. The requestor is, therefore, entitled to receive an amount of computer processing unit (CPU) operating time equivalent to the cost of 2 hours of computer operator salary. In order to reduce administrative steps required to calculate costs on an individual basis, agencies may establish agencywide average operator/programmer salaries and average CPU operating costs. According to OMB, 100 pages of free information should not be applied directly to microfiche, but to the "microfiche equivalent" of 100 pages. Similarly, audiotape distribution should be analogous to 100 pages of paper copies.

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[114] P.L. 99-570 (Fed. Reg. vol. 52, No. 59, 1987).

NEW TECHNOLOGIES AND THE NEED FOR AMENDING FOIA

As is evident in the courts, new communication and information technologies are raising essential questions about the fundamental nature of records and the parameters of searches for records. In several FOIA cases, the courts have expressed a need for Congress to clarify the numerous gray areas left open by the statute in its application to the new generation of computerized information. The *Yeager* court is one such example:

> [W]e decline Yeager's invitation to "view the availability of disclosure avoidance techniques as simply defining with more clarity the manner in which microdata information might be released." This invitation should be extended to Congress rather than to this court.[115]

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[115] 678 F.2d at 315 (D.C. Cir.1982).

The appeals court in *Yeager* mirrored the views of the district court regarding congressional specificity:

> [A]s agencies begin keeping more of their records in computerized form, the need to contour the provisions of FOIA to the computer will become increasingly necessary and more dramatic.[116]

At present, decisions about fundamental principles are left to agency discretion, with further interpretation, when litigated, by the courts. Consequently, these decisions may be subject to the biases of agency personnel, or be made by lawyers and judges whose understanding of new technologies may be limited. Some of the problems raised by new technologies may be clarified by the facts of individual cases and can be approached on a case-by-case basis. But many of the growing ambiguities need to be addressed through statutory amendment. As technology is continually evolving, setting objective criteria for defining records and search efforts will be a difficult task. Nevertheless, working toward greater specificity could be an important first step in ensuring an adequate level of public access to electronic information.

In developing and considering possible amendments to FOIA, it is important to understand the nature of emerging computer-related problems. It is also important to consider new developments in computer and database technology that could alleviate some of these problems in the future. A typology of the issues is presented below:

- **Electronic information technologies are obscuring the boundary between record and nonrecord material.** As electronic databases become more sophisticated, they resemble information "pools" rather than discrete records. For example, relational database technology allows data elements from different pathways or "fields" to be connected to one another in nonlinear combinations. The parallels to paper records are becoming more remote.
- **Computers are facilitating faster and more complex searches, encouraging a broader definition of a "reasonable" search.** Given computer capabilities for expedited searching, segregating, and consolidating of data, the definition of a "reasonable" search may need to be broadened.
- **Electronic FOIA requests can be incompatible with the ways agencies collect and organize information.** Although this problem also applies to FOIA requests for paper documents, computerized information management systems are aggravating the issue as they are relatively inflexible, with limited capacity to respond to inquiries in an *ad hoc* fashion. Evolving technologies such as relational databases and hypertext could provide some solutions in the future.
- **Computer searching raises new staffing and budgetary problems, as well as opportunities for Federal agencies.** Most agencies have no computer programmers assigned to FOIA implementation. Requests for computerized records are generally given to personnel hired to operate internal information management systems. Agency use of electronic technologies that could allow clerical and administrative staff to retrieve computerized information could ultimately enhance public access to computer records. These technologies include preprogrammed utility software, frontend systems with natural query languages, expert systems, and optical disks.
- **Federal agencies are using information products whose status is unclear under FOIA.** The status of computer programs (including computerized indexes, codes, and directories) is unclear, as is that of integrated software and database packages. Electronic mail, quickly becoming a major mode of interdepartmental communication, presents additional questions for FOIA.
- **Paper printouts of electronic information**

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[116] Memorandum Order at 6; App. at 44.

may not satisfy public access needs. Although the case law has established that computerized information is subject to FOIA, agencies are not required to deliver the information in machine-readable form. The option of encouraging or requiring agencies to provide alternative electronic formats—such as magnetic tape, floppy disk, optical disk, and online access—warrants consideration.

Electronic Information Technologies Are Obscuring the Boundary Between Record and Nonrecord Material

At the most fundamental level, new technologies are obscuring the boundary between record and nonrecord material. As information technology evolves, records become more difficult to conceptualize in terms of discrete, tangible documents. Information technology is, in a sense, detaching information from its embodiment. A record stored electronically may become a useful body of information only upon retrieval. The concept of database is replacing the concept of "record" per se. It thus becomes more difficult to establish genuine parallels between paper records and records stored in computers.

Electronic Information Often Requires Intervening Technologies To Become Understandable

In court cases involving computer records, analogies from paper documents are still being applied, implying a distinct boundary between record and nonrecord material. The courts are currently basing the delineation of this boundary on the *function* of retrieval: if information requires new programming for its retrieval, it is not an agency record (or it is an entirely new record, the creation of which is not required under FOIA). This type of functional definition is clearly easier to apply than other distinctions, but it may be inappropriate. At present, if an electronic file cannot be printed out with one push of a button, agencies and courts may determine that it legally need not serve as a record under FOIA.

The current records test, based on programming, is inappropriate because electronic information always needs some type of transformation to be understood. While written information can be read instantaneously, no one can look at the electronic bits of data in a database and understand their meaning. These bits of data often require specialized software for reorganization into readable form. As intervening technologies are necessary rather than superfluous, there is technically no such thing as a "record in being."

As Electronic Databases Become More Sophisticated, They Resemble Information "Pools" Rather Than Discrete Records

As electronic database systems become more sophisticated, electronic records become more difficult to conceptualize in terms of separable, identifiable entities. As records can be generated from data elements from different files, the information stored in databases may resemble "pools" of information rather than discrete documents. As the database technology continues to evolve, the parallels to paper records become more oblique.

For example, relational database systems, developed in the 1970s, allow discrete data items to be linked to one another based on specified underlying criteria. One record may therefore constitute a synthesis of information retrieved from several different files. In some cases, then, several pieces of data can or must be *connected* to make a record. The jargon in the field of relational technology reflects the pool-like aspect of the new databases. A collection of data is called a "relation" instead of a file. A record is, in effect, a series of relations or collections of data rather than a single file.

This represents a significant jump from the flat file technology of the 1970s where databases were designed in hierarchical or network fashion. In both hierarchical and network databases, information retrieval is linear. In the former, one piece of information is connected to others through a series of hierarchically-arranged channels. Access begins at the top of the hierarchy and spreads through subsequent levels of detail. While network databases are set up so that a single data element can "point" to other data elements, there is still a fixed pathway for navigating through the database. By contrast, in a relational database, data elements from different pathways or "fields" can be connected to one another in nonlinear combinations.

As a result, some forms of new programming or other intervening operations may be necessary to interpret or compile electronic records. Making analogies between paper and electronic records and using the function of programming to distinguish between record and nonrecord material could be detrimental to the intent of FOIA. If genuine access to records is to be preserved, a new focus may need to be placed on the substance, or information content, of databases, rather than the operations required to extract or interpret them.

Computers Are Facilitating Faster and More Complex Searches, Thereby Encouraging a Broader Definition of a "Reasonable" Search

As mentioned earlier, the legislative history of the FOIA indicates that a description of a requested record is sufficient if it enables a professional agency employee familiar with the subject area to locate the record with a "reasonable amount of effort."[117] At present, the definition of what constitutes a reasonable search is left to the discretion of agencies and, when litigated, the courts. As in defining records, the current test of reasonableness usually includes whether new programming is required.

This test may no longer be appropriate due to technological evolution. Given computer capabilities for expedited searching, segregating, and compacting of data, the realm of what constitutes a "reasonable" search could be broadening. In cases involving paper records, decisions in the courts as to what is reasonable have been related to the *effort* agencies are required to exert on behalf of requesters. In the computer context, some courts have concluded that *any* new programming or modification of an existing program should be deemed new record creation and, therefore, unreasonable. According to DoD's recent regulations pertaining to FOIA fees, electronic information for which there is no existing printout need not be attainable under FOIA.[118] Taken to its extreme, this regulation could be interpreted to mean that pushing a button to print a document would constitute new programming.

Thus, a subtle shift has occurred that has detached decisions about reasonableness from any considerations of effort. This is incongruous with tradition, as a significant amount of effort has historically gone into FOIA searching for and production of paper documents. Retrieval of paper documents may involve extensive tracking, communication with numerous bureaus, searching disparate files, and substantial hand deletion of exempted materials.

The programming/no programming distinction continues to decrease in validity as developing technologies reduce the effort needed to modify or execute new programs. In many cases, new programming to retrieve computer records may be less costly and/or time consuming than searches for paper records.

Clearly, drawing lines between reasonable degrees of effort is a difficult task. The functional approach is much more clear-cut. If Congress is to help set new criteria, it must take into account the rapid rate of technological evolution in data processing. What is not reasonable today may be reasonable tomorrow or in the near future. In spite of this, new criteria based on effort or cost could ultimately benefit agencies as well as requesters. Clearer standards could enhance public access as well as protect agencies from excessive demands by attorneys seeking to prolong FOIA lawsuits.

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[117] H.R. Rep. No. 876, 93rd Cong., 2d sess. 6 (1974), reprinted in 1974 U.S. Code Cong. & Ad. News 6271.

[118] 32 C.F.R. Part 286, 1987 (Fed. Reg. vol. 52, No. 132, July 10, 1987).

Degrees of effort needed to execute computer searches can vary dramatically. A request may be relatively easy to specify but difficult to run, requiring days of computer time. Another request may require hours of programming time, but can be searched easily once the program is created. An illustration of computer searches requiring varying levels of effort is presented below:

- Level 1. File ABCD exists in the computer. It can be retrieved with a "print" command. In other words, the data has already been collected and organized in the manner desired by the requester.
- Level 2. File ABCD exists in the computer. Though it cannot be printed directly, it can be retrieved from the database by using existing retrieval programming and entering keywords. The data does not need to be modified with a new algorithm.
- Level 3. Someone asks for E, which can be derived from ABCD using a new algorithm. Put simply, the agency maintains the data, but it must be modified to fit the request.
- Level 4. The request cannot be satisfied by information derived from ABCD. It may require additional information from FGHI or other databases. A new program must be created. This may involve a limited amount of effort through the application of simple query language or commercially available software. On the other hand, a new program could involve a complex query that takes days of a programmer's time and hours or days of computer time.

According to recent interviews with information management personnel at selected agencies, many choose to reprogram their computers, or modify existing programs, on their own accord. In some cases, this may benefit the agencies as well as the requesters. Contoured searches may be easier to execute than supplying large amounts of unedited or disaggregated data. In other cases, programming is motivated by the awareness that the effort undertaken would be less burdensome than that associated with a potential lawsuit.

An important consideration to remember is that the effort required for a FOIA search is not solely a function of the nature of the request. Effort is also determined by the structure of the database, the sophistication of information storage and retrieval tools, and the competence of agency staff. A poorly run retrieval system could require days to search for a straightforward record. A sophisticated system with higher-level language might be able to retrieve the same data in minutes. Clearly, Congress cannot mandate the acquisition of state-of-the-art computer systems. But if searches are to be based on effort, and if requesters continue to be charged for computer programming and operation time, measures must be undertaken to encourage agency efficiency.

Electronic FOIA Requests Can Be Incompatible With the Ways Agencies Collect and Organize Information

One of the greatest problems encountered in satisfying FOIA requests is that requests are often incompatible with the ways in which agency records are originally collected and organized. For example, at the Occupational Safety and Health Administration (OSHA), a regulatory agency, most inspections are undertaken and documented by geographical region, industry, accident, or type of complaint. The databases created by OSHA follow the contours of the different inspection programs within the agency. FOIA requests, on the other hand, are usually directed to specific products or companies at particular locations. Since the agency does not maintain such a database, these requests may require new programming.

While the lack of compatibility between requests and compiled information is a problem that also affects requests for paper records, computer retrieval in some ways exacerbates the problem. Although computers can be fast and consistent, they may be less flexible than the manual systems they have replaced. While they are proficient at processing anticipated forms of information, they are less adept at performing operations (such as responding to FOIA requests) that have not been preprogrammed into their software or machine language.

Certain new developments in hardware and software technology —such as relational databases and hypertext—promise to enhance computer flexibility and responsiveness to unanticipated forms of requests. New technologies will also increase the speed of all forms of data processing. These developments will ultimately reduce the effort associated with retrieval of electronic information, and therefore could have positive consequences for FOIA, allowing for: faster searches; searches through unorganized data; integration of data from diverse files; and better response to ad hoc requests.

Technologies Could Facilitate Ad Hoc Responses to FOIA Requests for Computerized Information

Relational Databases

As relational database technology increases in sophistication, users can more easily pull together data from different files in an ad hoc manner. The links between different data fields do not necessarily need to be preprogrammed; instead, they can be created to suit the requirements of specific requests. Programming new links varies in difficulty, depending on the software. The increasing flexibility offered by relational database technology could have major significance for FOIA, allowing the computer to provide information better tailored to the needs of requesters.

Hypertext

Hypertext software, still in early phases of commercial development, will also allow for enhanced ad hoc data retrieval. In theory, hypertext allows a user to design a database from scratch. Links can be established between unstructured bits of information; hypertext does not impose a linear display of data. Hypertext incorporates images and sound as well as text.

Institutional Changes Could Increase Compatability Between FOIA Requests and Available Information

In addition to new technologies, certain institutional changes could help alleviate the problem of responding to requests that are incompatible with the ways information is collected. Some options are:

- **Tallying frequent requests.** Tallying the most common types of requests for computerized information could be a first step in enhancing compatibility between data and requests. This could lead to the development of utility programs tailored to retrieve organized data, and could influence a greater awareness of public access needs in the data collection phase. OSHA is currently documenting its most frequent FOIA requests every 6 months.
- **Public input in data collection.** Pilot programs could be initiated to allow citizens and public interest groups to inform agencies about the types of data that would be most beneficial to them. Public input would also help determine the delivery formats that would be best suited to requesters' needs.
- **Public input in the records-searching process.** Some agency regulations require their FOIA offices to consult with requesters to help tailor searches to requester needs. In some cases, requesters are allowed to "walk through" agency computer systems. If an agency is incapable of conducting a search, a requester could be shown how to narrow the inquiry, or conversely to broaden the request to allow files to be copied without editing or selection.
- **Standardized information delivery systems.** Current, custom-built agency information systems rarely take public access into account. Setting standards for agency hard-

ware and software could enhance compatibility with users' equipment.

- **Utility programs.** The creation of preprogrammed utility software for commonly-occurring requests could facilitate more efficient and appropriate responses. Utility programs are discussed in the following section.

Computer Searching Raises New Staffing and Budgetary Problems, as Well as Opportunities for Federal Agencies

Many agency FOIA offices are understaffed, and to the best of OTA's knowledge, none have computer programmers specifically assigned to FOIA. As a result, FOIA requests for computerized records are typically shunted to Automated Data Processing (ADP) departments, where they are handled by personnel hired and trained to run internal computer operations. As FOIA fees are forwarded to the Department of the Treasury rather than being credited to specific agencies, there are few financial incentives for agencies to respond to requests for electronic records. Policy could be changed to establish an annual congressional appropriation for the implementation of FOIA, or to allow agencies to retain FOIA fees at least as a partial offset against expenses. As there are usually no computer operaters on FOIA staffs, agencies could be required to hire at least one full-time computer programmer to accommodate FOIA requests involving computer work. In addition to policy initiatives, new technologies could help alleviate staffing problems and reduce costs of processing certain FOIA requests. Technologies that could relieve ADP specialists from FOIA demands could facilitate access by clerical and administrative staff, and ultimately enhance public access to computerized information. Several of these technologies are discussed below.

Technologies Could Help Nonspecialists Respond to FOIA Requests for Computerized Information

Utility Programs

The development of commercial and custom-made utility programs could facilitate responses to some types of requests, especially more common types of requests that could be predicted in advance. Utility programs are generic software programs that can perform anticipated functions. They contain a set of retrieval operations that can be invoked without programming. Thus, even if an agency had little interest in compiling a record for its internal purposes, the record could be generated much more easily than in the past.

The trend from mainframes to microcomputers, a hallmark of the 1980s, is allowing for greater user autonomy. In theory, clerical workers could be trained to handle some programming functions currently executed by ADP professionals. Administrative staff traditionally handle FOIA requests for paper records; therefore, from a staffing perspective, the use of utility programs could make some types of computer searches more similar to searches through paper files.

According to agency information managers interviewed, some are already beginning to tally their most common FOIA requests and design their own utility programs to accommodate them, eliminating the need for new programming. Searching with utility programs can be significantly less expensive than searching on mainframe, tape-driven systems. As the effort involved in satisfying certain requests is decreasing, new classes of requests could fall into the "reasonable" domain.

Networked PCs and Network Servers

As stand-alone PCs become linked through local area networks, individuals at work stations can gain increased access to large databases through "network servers." These are specialized computers with larger storage and processing capacity than work stations. The network server is a shared machine that allows individuals at their own work stations to update, process, delete, and insert new records from remote locations. Networked PCs and network servers could give nonspecialists greater access to more powerful computer operations, including larger and more sophisticated databases. Therefore, like utility programs, they could contribute to the goal of helping administrative staff process FOIA requests for computerized information. Network servers equipped with optical disks could optimize access to large volumes of records.

Front End Software

Advances in front-end software are contributing to the possibilities for nonspecialists to write new programs, by translating complicated query languages into natural language. (A query is a command that tells a computer which fields to search and combine. At present, different databases and brands of computers require different query languages.) The growing simplification and standardization of queries could significantly reduce the amount of effort involved in some forms of new programming. In the future, better front-end technology could facilitate direct queries from home computers or from PC's in agency public reference rooms.

Expert Systems

Expert systems contain inference or decision making programs that are combined with data entered by users. Expert systems software contains programmed search rules that help users decide how to maneuver through datafiles to answer particular questions. While expert systems are limited by the logic of the experts who create the programs, they could help agency personnel respond more easily and quickly to predictable FOIA requests.

Artificial Intelligence

Future artificial intelligence systems will have more self-initiating capabilities than do expert systems. Artificial intelligence software helps users ask the questions appropriate to solving problems. A master control programs directs users to appropriate expert systems through question-and- answer sessions undertaken in natural language. While artificial intelligence systems are still in early developmental phases, it is expected that, in the future, they could eliminate the need for users to remember complex codes or commands. Users will be able to articulate their questions fully in natural language.

Optical Disks

Optical disks and related search and retrieval software could greatly enhance records-storage capacity and facilitate searching through unstructured information. While manual searches for archived paper documents can take days, weeks, or even months, searches through an equal number of full-text records on optical disks could technically be accomplished in seconds or minutes.

Federal Agencies Are Using Information Products Whose Status is Unclear Under FOIA

In addition to software programs and online databases, whose status under FOIA has begun to be debated in the courts, Federal agencies are embracing additional technologies that need to be studied in the context of FOIA. Two examples are presented below.

Integrated Software and Database Systems

When databases and their integrative software are combined into one system, the functional distinction between "programs" and "records" loses its validity. As the software is necessary to make the database or record comprehensible, the program may need to be supplied along with the record.

Electronic Mail

Electronic mail is significant for FOIA in that it allows data to be created, transmitted, processed, analyzed, archived, and disposed of electronically, without paper printouts. As government communications are increasingly carried out via electronic mail and other computer applications, "records" may never exist in tangible form or in a "narrow, physical sense." Under current judicial interpretations, these forms of communication could be withheld from public view. The "record in being" concept, which continues to be used in the courts and in agency regulations, may need to be revisited.

The Iran-Contra case recently demonstrated that electronic mail can provide valuable information about government activities, information which the public may have a justifiable right to know. The National Security Council's PROFS electronic mail system provided the public with crucial information about the diversion of funds to the Nicaraguan Contras. This information was retrieved from a temporary PROFS backup file that had been created to protect users against electrical power surges or other interruptions.

The question electronic mail poses for FOIA is whether messages should be treated like agency records or like confidential personal communications such as telephone calls. If some types of electronic mail communications are to become accessible under FOIA, they must be stored, backed up, archived, and/or printed. In cases where electronic mail messages are considered analogous to telephone conversations or personal meetings, the FOIA need not apply. Monitoring or required archiving of telephone calls could be considered similar to wiretapping.

The questions of which electronic mail communications require archiving for FOIA purposes (as well as for records retention purposes), and how some messages differ from others under FOIA, need to be answered in order to develop consistent policies for electronic mail. These new policies may need to focus upon the content of the communications rather than the form. While most electronic mail systems have "document" as well as "message" features, archiving should not be limited to documents. Increasing numbers of important agency actions and decisions are resulting from electronic mail messages. Though assessing the import of messages and distinguishing between deliberations and final orders may be difficult, taking these steps may be necessary to ensure appropriate public access.

Paper Printouts of Electronic Information May Not Satisfy Public Access Needs

Although both the case law and the FOIA fee guidelines have established that computer-stored information is subject to FOIA, requesters are not guaranteed access to this information in formats other than paper. Though the case law is extremely limited in this area, the D.C. District Court decided in *Dismukes* v. *Department of the Interior*, that "an agency has no obligation under FOIA to accommodate a particular requester's preference regarding the format of requested information," and that agencies need only provide information in "reasonably accessible form."[119] If requesters ask for tapes, disks, or direct online access, they are not assured their choices. The decisions generally rest with agency information custodians.

Technological change brings into question whether paper printouts alone are a satisfactory means of satisfying requests for electronic information. It could be argued that tapes, disks, or even online retrieval might be necessary to effectively use or analyze large quantities of raw data.

In practice, agency decisions about format vary widely. Some agencies provide data tapes, disks, and software, either to save time, lower costs, or enhance public access. Some State and Federal agencies are beginning to offer remote access to electronic records. Most Federal agencies, however, continue to satisfy their minimum legal requirements by producing paper printouts of electronic information. A brief discussion of alternative delivery formats is presented below.

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[119] 603 F. Supp. 760 (D.C. District Court, 1984).

Magnetic Tapes and Disks

Providing tapes or disks to requesters could relieve agencies from computer searching and printing efforts. For requesters, tapes and disks eliminate the need to re-input information, and facilitate analysis and synthesis of statistical information. As a drawback, distributing tapes or disks could result in additional time commitments for agency personnel. Requesters generally ask for explanations of data structures and need help designing programs to retrieve machine-readable data. Whether accurate or not, some agency personnel feel that releasing tapes and disks would increase possibilities of information manipulation and misrepresentation of agency statistics and opinions. Other information custodians readily release tapes and disks, although some include caveats to reduce the risks of false attribution.

Optical Disks

Optical disks may provide an economical means of distributing records to satellite reading rooms and depository libraries. Optical disks are simpler and less expensive to duplicate than large quantities of paper documents. Automated retrieval software could facilitate searches for FOIA records on disks.

Computer Programs

Computer programs contain the instructions that direct machines to store, retrieve, and manipulate data. For the purposes of FOIA, the status of programs is in a state of flux. Agency views about programs are disparate—they are sometimes considered records and sometimes tools. When deemed tools, programs are not considered subject to FOIA.

Whether programs are considered tools or records, some types of records may be inaccessible without them. Agencies must learn to distinguish fairly between programs required to interpret records and programs that further analyze or manipulate data; the former may need to be released and the latter subject to agency discretion. When programs incorporate instructions that reveal agency decisionmaking techniques or information gathering methods, they may constitute records in their own right.

In 1980, a Florida appellate court embraced a broad definition of agency records that could have implications for the status of software. In *Shevin* v. *Byron, Harless*,[120] the court held that, "a public record is anything made or received in connection with the agency's business that is intended to communicate knowledge."[121] In many instances, program software serves that function and could be considered a public record, unless deemed sensitive or proprietary.

As mentioned earlier in this chapter, another appellate court in Florida has compared software programs to code books accompanying written documents. In *Seigle* v. *Barry*,[122] the court determined that the information stored in a computer was analogous to information recorded in a written code. If a written public record were maintained in such a manner that it could only be interpreted with a code, then a code book should be provided to requesters. According to the court, it followed that computer programs should be furnished to requesters when electronic information would otherwise be inaccessible.

Remote Access

The growing use of personal computers with modems opens up entirely new possibilities for remote access to computerized FOIA records. Some agencies are making public records available online in public reference rooms and at remote locations.

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[120] 379 So. 2d 633 (Fla. 1980)

[121] Ibid.

[122] 422 So. 2d 63 (Fla. 4 D.C.A. 1982)

Remote access to Federal information could facilitate searches for requesters as well as agencies. Remote access would allow users to issue queries directly, reducing search time for agencies. Currently, FOIA requests are issued on paper, and computer programs are written at the discretion of agency personnel. If data are distributed in hard copy or tapes, users are required to re-input or download to their own computers.

If remote access is to be considered as a delivery option for FOIA records, the following areas would need to be addressed: security; liability for errors; cost; requirements for user assistance; upkeep of data files; privacy protection; control of levels of use; standard setting for hardware and data presentation; and competition with private online database vendors.[123]

Computers Are Prompting New Discussion About the Basic Purposes of FOIA

The original movement for enacting Federal freedom of information laws in the United States gained momentum in the 1940's and 1950's. In 1966, when FOIA was passed, the assurance of basic access to government records represented a significant strengthening of the open government principle. Although the United States Government is now heralded internationally for its policies of openness, FOIA is still narrowly interpreted as a basic "access to records" statute.

In addressing the impacts of new technologies, Congress may need to reconsider the purposes and goals of FOIA. If new procedures need to be instituted for an electronic FOIA, the policies behind the procedures should be evaluated and clarified. Computer records bear few similarities to the paper records of 1966. New database technologies have begun to raise questions about whether computer-stored information can even be conceptualized in terms of discrete records.

For the 1990's and beyond, Congress needs to decide whether the FOIA should continue to be viewed as an "access to records" statute or whether it should be perceived more broadly, as an "access to information" statute. This is not to suggest that public access to computer-stored government information should be unlimited; access must be balanced against economic and personnel constraints of Federal agencies. However, due to the explosive growth in electronic information storage, processing, and transmission by the Federal government, traditional views about records and searches need to be modified to ensure even basic access to public information.

As technology is continually evolving, setting objective criteria for defining records and appropriate search efforts will be difficult. Nevertheless, working toward greater statutory specificity could be an important first step in ensuring an adequate level of access. If the statutory language is not modified to address electronic information, agencies may have new opportunities to legally withhold certain classes of materials from the public. The case law in many areas is too limited, conflicting, or vague to give comprehensive or consistent direction to agencies and courts. Even in those areas where the case law is clear, variation in agency practice calls for stronger legislative guidance. If Congress wishes to maintain the integrity of the FOIA in an electronic environment, the goals of the statute should be reassessed, and statutory amendment pursued.

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[123] Florida State Legislature, Joint Committee on Information Technology Resources, *Remote Computer Access to Public Records in Florida*, January 1985.

Chapter 10

The Electronic Press Release and Government-Press Relationships

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Reporter sitting at video display terminal

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Chapter 10

The Electronic Press Release and Government-Press Relationships

SUMMARY

Although the Federal Government disseminates information through several means, the largest cross section of the U.S. population receives its government information via the press. Some Federal agencies have begun to design electronic mail systems to distribute press releases and other time-sensitive information (such as crop reports, weather bulletins, and economic and trade data) to newsletters, news magazines, and television and radio news broadcasters. If managed properly, electronic press release services could provide cost-effective and efficient alternatives or supplements to traditional messenger or mail delivery of paper releases.

The goals of this chapter are to examine current methods of delivering perishable information to the press, to explore a range of technological and strategic alternatives for electronic delivery of Federal news and data, and to examine the implications of electronic delivery for effective and equitable access by the press. To the extent that electronic dissemination by the Federal Government affects the ability of the press to cover and report on government activity, Congress has an oversight role to ensure that access by the press is enhanced.

At present, Federal agency use of electronic news distribution systems is highly variable, and the implications for equity of press access to Federal information have not been fully considered. The primary advantage of the electronic press release is timeliness, both for regional newspapers and media outlets, as well as for Washington, DC news organizations that otherwise would depend on the mail or expensive messenger services. In general, electronic press releases are more cost-effective than courier or messenger services. Also, electronic press releases can offer greater selectivity and more efficient archiving than paper formats.

Federal agencies currently use a variety of contractor-provided or commercial services for electronic dissemination of perishable information. Some of these services are provided in response to agency initiatives; others are provided by vendors purely as a commercial offering to the news industry.

The most important issue for Congress to consider is equity of press access to agency press releases and other time-sensitive information. While electronic press releases could be especially helpful to smaller, out-of-town news organizations, the potential benefits could go unrealized if costs or technical barriers are prohibitive. The Federal Government may need to consider paying for electronic press releases entirely with Federal funds (at no charge to the press); charging the press only the marginal cost of dissemination (excluding costs of developing and maintaining databases); or establishing sliding-scale fee schedules for smaller or less affluent news outlets. At least for a lengthy transition period, dual format (paper and electronic) would appear to be necessary to ensure that those news outlets without, or lacking interest in, online capability are guaranteed access to traditional press releases and perishable data.

At the technical level, a number of alternative electronic press release delivery systems warrant consideration, including:

- computer-to-computer electronic mail;
- electronic wire services;
- electronic bulletin boards;
- facsimile transmissions; and

- electronic mail or wire services with abstracting, printout, and storage capabilities.

The latter alternative may provide a desirable balance between the visible, tangible paper copy offered by traditional wire services, and the selectivity and archival capability offered by computer storage.

Other issues that warrant attention include the need for a more complete, consistent, and better coordinated approach to Federal agency electronic press release distribution; standards on archiving and quality control; and guidelines for involvement of private sector contractors in disseminating electronic press releases. Decisions about the future direction of Federal electronic press release services should take into account the specific functions and problems of agency press offices, as well as the current status of automation in press newsrooms.

INTRODUCTION

Although the Federal Government disseminates information through several means, the largest cross section of the U.S. population receives its government information via the press. The recent General Accounting Office (GAO) Survey of Federal Information Users indicated that newspapers, newsmagazines, and newsletters are among the primary means by which the public obtains Federal information (see ch. 5, Table 5-11, for partial survey results). Since World War I, Washington, DC has emerged as the principal locus of news generation in the United States, reflecting the growing importance of the Federal Government as a major source of information to the U.S. press.

The press serves a unique intermediary function between the government and the public. It functions both as a "private citizen" or user of public information in its own right, and as an interpreter and disseminator of this information.

This chapter explores how reporters receive information from the Federal Government, and examines government press offices and press newsrooms—essential links between public information providers and private information gatherers. As these links begin to take electronic and digital form, a change may be taking place in the timeliness and even content of news stories.

The press obtains Federal information through a wide variety of channels (including direct contacts, press releases, Freedom of Information Act requests, and published data and reports). This chapter focuses on press releases (concise, written summaries of news and data), and explores electronic alternatives to the traditional modes of distributing press releases and other time-sensitive information to the news media. While some Federal agencies already disseminate press releases electronically, participation is far from complete, and numerous policy questions need to be considered. The following evaluation of alternative methods takes into account the functions, problems, and status of automation in agency press offices and press newsrooms.

The discussion is based primarily on interviews with press officers, members of trade associations, electronic information vendors, wire service providers, and reporters, editors, librarians, and systems managers at small and large papers throughout the country. The goal is to highlight general trends and issues that warrant congressional attention, and to point toward areas requiring more systematic and intensive research in the future. Press offices, according to Don Obendorfer of the *Washington Post*, are "the junction point where the government and press meet. For most reporters, it's what it's all about—the clips, the releases, the briefings—and yet nobody ever studies that stuff."[1]

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[1] Steven Hess, *The Government/Press Connection* (Washington, DC: The Brookings Institution, 1984).

FUNCTIONS AND PROBLEMS OF AGENCY PRESS OFFICES

When evaluating technologies or institutional arrangements involving the working press, a very important element to consider is time. The goal of a reporter is to maximize his/her news gathering and reporting in minimal amounts of time and to cover breaking news. The timeliness of press releases and their delivery can help determine whether a news story makes front page headlines or is buried inside. In the aggregate, newspaper and media coverage can help shape the public perception of the importance of events, and eventually mold the constellation of issues that merit public policy attention.

The functions of government press offices are difficult to generalize. Federal Government press offices are as varied in quality as are reporters' perceptions of their utility. The complexion of any given press office may change with each administration in terms of personnel, budget, ratio of career civil servants to public appointees, involvement in broader public affairs functions, and overall objectivity of the information disseminated. Within a single press office, certain individuals may win the trust of reporters while others function as agency apologists.

Aside from these significant differences, press officers perform similar basic functions: arranging press conferences, briefings, and interviews; and notifying reporters of events and publications through press releases, press advisories, wire service releases, and telephone calls. Most also serve a broader fact-finding and verification function. Like reporters, press officers have beats within their agencies, allowing them to become familiar with personnel, issues, and procedures in specific areas of agency activity.

An important, but often overlooked, function of the press office is the daily collection and circulation of news clippings to senior agency officials. Many government executives learn what is being written about their actions, their agencies, and their adversaries through these intensive doses of narrowly-focused news. In terms of political agenda-setting, the clippings files have served to enhance the influence of the newspapers, particularly the *New York Times* and the *Washington Post*, over the broadcast media and also over papers from other regions. Some papers that merit attention have been excluded by clipping services due to their distance from Washington. The use of online dissemination has begun to change the mix of newspapers represented in the files, and could perhaps affect government perspectives on regional outlooks and issues. The White House has subscribed to a computerized clipping service since 1982.

The growth of the Washington press corps has heightened the need for press offices. Press offices serve, in part, to facilitate the government information function in the form of press conferences, briefings, and the distribution of prepared materials. As government grows, bureaucracies become increasingly difficult for reporters to cover; the press office performs a coordinating and frequently centralizing function at the press-government interface. It also may serve as a buffer to discrimination in reporting. While reporters often seek to bypass press offices and contact technical and policy staff directly, access to top officials is generally accorded largely to reporters from the most prestigious and well known media outlets. Press offices, on the other hand, are mandated to respond to diverse news organizations. Although some degree of discrimination may occur even here, these offices serve to institutionalize at least some degree of access by all members of the press.[2]

Most large agencies have highly decentralized press functions, with a department-level office answering to the national media. For example, all major agency components at the U.S. Department of Agriculture (USDA) have their own information offices. The National Aeronautics and Space Administration (NASA) press activities are separated both functionally and regionally, with separate press and public relations offices in different programs as well as regional NASA centers. Decentralization may complicate news-gathering tasks, but at the same time allows press officers to maintain closer contact with their sources within agencies.

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[2] Ibid.

A problem affecting some press offices that are attempting to create online release services is the competition for funding and control with agency Information Resources Management (IRM) offices. When the Paperwork Reduction Act of 1980 was enacted, the role of the press offices as potential generators of online services does not appear to have been considered. In several cases, IRM personnel have assumed responsibility for designing delivery systems to serve the press. IRM staff, generally schooled in computer programming and data processing, may have little or no understanding of journalistic perspectives and requirements.

The growing trend toward combination of press activities with public affairs activities presents another possible barrier to effective press operations. In 1981, the Office of Personnel Management (OPM) instituted new job standards that require press officers seeking promotion beyond a GS-13 level to be trained in the range of public affairs functions. Public affairs activities include organizing exhibits, producing graphic and broadcast materials, conducting visitor and outreach activities, and developing advertising programs. These new job standards may serve as disincentives for trained journalists to apply for positions in Federal agencies. In a few years, it may become increasingly difficult to find specialized press officers in the Federal Government.

STATUS OF AUTOMATION IN FEDERAL AGENCY PRESS OFFICES

In recent years, several Federal agencies and departments have initiated electronic press release services. According to the GAO survey of 114 civilian agency components (see ch. 4, Table 4-24), the following percentages of agencies already used or planned to use electronic means for the release of information to the press: electronic mail (28 percent); electronic bulletin boards (12 percent); electronic data transfer (13 percent); and floppy disk (7 percent).

The adoption of electronic news dissemination technologies is not uniform among agencies. Six brief examples are presented below.

U.S. Department of Agriculture (USDA)

As a first example, USDA has undertaken an intensive effort to deliver news releases and other perishable information by means of electronic services. The effort was motivated, in part, by a desire to save on postage costs and to comply with the Paperwork Reduction Act and OMB guidelines.

USDA Online, produced by the USDA information office, includes:

- national and regional press releases;
- two-page daily briefings of news stories affecting USDA programs;
- databases on food, nutrition, animal health, and agricultural trade;
- agricultural statistics and economic reports;
- calendars of events;
- phone listings of USDA personnel; and
- an electronic messaging service.

Due to funding constraints, USDA cannot provide this electronic service free to the press, although free printed press releases and press mailings are still provided. USDA Online is available on *FedNews* through Dialcom, Inc., a commercial electronic mail service. To date, the service is used primarily by land grant colleges and universities, trade associations, Federal and State agricultural agencies, and farm bureaus.

USDA also maintains an independent, full-text delivery service, EDI (Electronic Dissemination of Information), which releases only perishable information. EDI was designed as a wholesale information service, contracted through Martin Marietta Data Systems to sell USDA information to resellers or "multiplexers." EDI contains information from several of the USDA agencies. EDI includes crop and livestock reports, agricultural research reports, national and regional press releases, daily two-page news briefs, and other perishable information.

U.S. Supreme Court

The Supreme Court is planning for electronic distribution of judicial opinions. The initial push for automation at the Supreme Court came from the press in 1982, by way of the American Newspaper Publisher Association and the American Society of Newspaper Editors. These trade associations were motivated by the demands of out-of-State news reporters who wanted direct and quick access to Supreme Court opinions. Supporting the request were the looseleaf and the legal database services, such as West, Mead, and the Lawyer's Co-op, which currently transcribe the full text of decisions from hard copy into their databases. Also supporting the initiative were State court judges and lawyers who believed that wire service synopses did not adequately describe opinions.

Supreme Court opinions are currently transmitted to the news media via paper. Prior to entry into online databases, such as Lexis, Westlaw, and BNA Online, they need to be scanned or transcribed. Reporters in the Supreme Court press gallery are the first to obtain copies of new decisions.

About 150 new decisions are issued by the Supreme Court each year. The Court provides 175 photocopies or "bench copies" of each new decision, and subsequently prints slip opinions (bench copies in a slightly different form) which are released two to three days after the opinions are handed down. More than 4,000 copies of each new decision are printed by U.S. Government Printing Office (GPO), including 400 for the Court, 225 for the Administrative Office of the U. S. Courts, and 360 for the Department of Justice. Slip opinions are provided free of charge to the press and public. Bound volumes of opinions, the *United States Reports*, are available from GPO, about 18 months after the Court recesses. Opinions are also reprinted by commercial vendors.

The time value of electronic release would be extremely important for State and Federal courts whose verdicts may be hinging on Supreme Court decisions. Requests from Federal judges are currently handled piecemeal, and distributed by facsimile machines. Within the next several years, computer-aided legal research will be available in the chambers of all Federal judges; and as a consequence, the desirability of online transmission will increase. Legal reporting services currently receive the full text of opinions by mail or messenger.

Online full-text release of Supreme Court opinions would be of value to the press for several reasons. The instant availability of full text at remote locations would allow reporters to solicit informed commentary from affected parties as well as legal scholars. In addition to reporters on the Supreme Court beat, editors, financial reporters, and reporters on related beats would gain access to copies of decisions. Online full-text release would allow for broader participation in the analysis of decisions and their impacts.

Online release of Supreme Court opinions could have regional significance as well. When several opinions are handed down on the same day, cases of regional interest are often overlooked by the national newspapers and news broadcasters. Online delivery of decisions could give regional news organizations greater autonomy in reporting their stories. The Court is currently considering the possibility of working with a single, nonprofit organization to serve as a depository or disseminator of opinions at the lowest cost to the public.

Environmental Protection Agency (EPA)

Known by the news community to have one of the most responsive press offices in Washington, EPA has chosen not to employ an electronic news release system. Instead, the agency pays for regular messenger runs to about 50 publications in Washington and mails additional materials to media in other regions. EPA also mails releases to any citizens requesting them, maintaining a current mailing list of 3,000. At its current level of computer sophistication, EPA has not found a system that is priced comparably to hard copy. After polling newspapers, EPA found that most were not adequately equipped to receive releases via Dialcom, Inc. electronic mail, a system that EPA relies on for its internal communications. According to EPA, only a small percentage of the larger papers can effectively use electronic mail releases. In addition, the trade publications that focus on EPA activities (e.g., *Inside EPA*, *Toxic Materials Report*, *Clean Water Report*) generally lack dial-up electronic capabilities. Although EPA sees flaws in messenger services (too slow for late-breaking stories, increased pressure to release announcements early), it still finds them to be an economical and thorough distribution mechanism. EPA does send releases to *U.S. Newswire*, a new wire service that transcribes hard copy releases and transmits them mainly to the larger papers and bureaus in Washington.

White House

In 1984, in an effort to reduce the voluminous paperwork involved in its media relations activities, the White House pilot-tested an online news release program with an exclusive feed to Dialcom, Inc. for incorporation into its electronic mail system. Controversy ensued, however, when other private sector vendors demanded equal access to this online information. The White House press corps objected to these services as a potential threat to their own viability, voicing procedural concerns about breaking traditional "rules of the briefing room" regarding judicious attribution of sources. Furthermore, some members of the public expressed propaganda concerns. Users of the system complained that the White House was slow to enter briefings into the daily system, making the service less valuable than expected.

The White House has since discontinued its electronic effort. Press releases in hard copy format are left in the New Executive Office Building for members of the nonresident press corps. Transcripts of briefings now remain on file in the White House press room, ostensibly accessible only to the White House press corps (1,800 reporters). Nevertheless, White House briefings are independently taped by commercial newswire services (such as the *Federal News Service* and *Press Text*) that transmit the transcribed texts verbatim to clients.

Bureau of Labor Statistics (BLS)

Although BLS makes its employment figures, Consumer Price Index, Producer Price Index, and collective bargaining settlements available online, it has found that the broadest segment of the press is neither equipped nor organized to receive electronic mail transmissions, and still prefers paper copies of releases. Most of its online subscribers are libraries and research organizations. Particularly in cases of embargoed release times (for the unemployment rate and the Consumer Price Index, for example), BLS has found that reporters prefer to retrieve hard copies at the agency press office and telephone their stories, rather than wait for releases to print from computers. Wire services also prefer this method, as they may be required to feed broadcast news programs which may be aired within a few minutes of these releases.

The Federal Election Commission (FEC)

FEC provides detailed campaign finance information online in a variety of formats. FEC has made innovative use of its Freedom of Information Act (FOIA) infrastructure to satisfy requests from the press and public for computerized and computer-generated information. It merits mention as it has managed to keep prices relatively low for its users, including the press. FEC accomplished this by coupling its delivery services with its internal computer service contract with Digital Equipment Corp., avoiding intermediate delivery services. Connect charges and annual fees have been avoided, and FEC data can be accessed at an hourly usage charge of $25. All the major national news media in Washington receive this service. Smaller newspapers may request paper versions of reports that are free to requesters. FEC rationalizes its program as a spinoff of the FOIA process. Under FOIA, FEC has provided computer tapes upon request since 1980. The Commission subsequently added a dialup capability to the operation, which allowed them to provide the tapes outside of the FOIA process and charge user fees. Requesters can choose either to receive reports online, or download raw data into their personal computers to be reworked with desktop software.

STATUS OF AUTOMATION IN PRESS NEWSROOMS

It is difficult to make predictions about future penetration of Federal electronic information dissemination technologies into newsrooms. First, electronic offerings of the Federal government are slowly and unevenly making themselves known to the media they wish to target. Second, newsroom technology is in a state of transition. It is difficult to predict whether newspapers will evolve in a linear fashion toward greater technological sophistication, or whether cultural and practical barriers will stunt technological growth.

During the seventies, the newspaper industry adopted computerized word-processing, editing, and publishing systems. With some major exceptions, mid-sized newspapers were the first to accept new technologies. The *Detroit News*, the *Providence Journal* and the *Des Moines Register*, for example, automated their newsrooms long before the *Washington Post* or the *Wall Street Journal*. Due to the cumbersome nature of retooling, a number of the largest papers are still in the process of automating various production and editorial functions. At the other end of the spectrum, the smallest papers, although computerized, sometimes lack the resources and personnel needed to handle large amounts of incoming electronic data. Automation in newsroom technology has grown out of the automation of production technology. Several large papers today are curious hybrids of obsolete newsroom technology and avant garde production equipment.

It is not coincidental that automation and consolidation in the newspaper industry both occurred during the seventies. Chain ownership has decreased the risks associated with experimentation and has been an important catalyst for innovation. Several small, chain-owned papers have been selected as prototypes for newsroom automation. These papers generally are chosen for their secure positions in noncompetitive or physically isolated markets. The first paper to use electronic pagination, part of the electronic publishing technology that is revolutionizing the nature of production, was the *Pasadena Star*, a small paper belonging to the Knight-Ridder chain. Knight-Ridder selected another of its small papers to experiment with changes in circulation hours. Gannett, the largest domestic newspaper chain, has selected a small paper in Cocoa Beach, Florida, to experiment with new technological as well as editorial concepts.

An organizational manifestation of the computer revolution among newspapers is the growth in importance of the newspaper library, a central locus of online database retrieval. This centralizing trend is likely to continue as a means of controlling database retrieval costs. As database retrieval frequently requires specialized knowledge of different search protocols, the importance of the newspaper librarian is likely to grow.

As a group, news writers are slow to embrace new technologies. The legendary black Royal typewriter still maintains an elevated position in many newsrooms alongside oversized word-processing screens. Editors are less inclined to use electronic technologies than younger reporters who have grown up with portable personal computers.

There are two classes of information that reporters at some newspapers can retrieve from the computers at their desks: wire services and clippings files. Relatively few newsroom PCs are equipped with modems. Desktop wire access can be highly efficient. At the *Louisville Courier Journal*, reporters' desktop computers are programmed to segregate over 100 wire services into queues according to subject matter (sports, politics, Washington news), as well as type of service (AP advisories, AP domestic, AP international, AP Washington, Supplementary Washington wires, Supplementary international, etc.). Reporters can also receive Nexis, Vu/Text, and other commercially available news clipping files.

Computers in the newsroom have changed the process of writing and the substance of news. From the field, stories can now be relayed electronically between reporters and editors, allowing for quick turnaround time of edited drafts, and potentially involving more individuals in the story-writing process. This opportunity did not exist 5 years ago when stories were written on paper and dictated over telephones.

USA Today has revolutionized the newspaper business in its production and distribution technologies, as well as its format. The *USA Today* emphasis on short stories has made it dependent on wire services to a higher degree than most large papers. The emphasis on graphics in *USA Today*, facilitated by new technologies, has placed a premium on the inclusion of statistics in its incoming wire service reports, thus affecting the way wire reporters gather their news.

In terms of online databases, the innovators for the newspapers have been the full-text newspaper compendia. For example, in addition to Nexis, the *Washington Post* receives Vu/Text (regional papers), Datasolve (full text of the *Economist* and the *Financial Times*), and Data Times (newspaper texts and gateways to Dow Jones). The *Post* has recently expanded the range of its online subscriptions to include DIALOG, PaperChase and Grateful Med (medical), Dow Jones News/Retrieval, Legi-Slate (congressional information), FEC campaign finance data, BLS releases, the *Federal News Service* (wire), and *US Newswire* (U.S. government news). It is soon to receive Wilsonline (bibliographic citations to journals) and Compu-Serve.

Small regional and local papers without Washington bureaus should be considered independently because their needs, interests, and resources are distinct from larger papers. They are particularly interesting to study in the technological context, because online technologies could open new communication channels and give them greater autonomy in reporting national news.

Today, Federal Government information is a relatively small fraction of the news of regional and local papers. This results from a lack of interest as well as resources. Small papers have become dependent on national wire services and telephoned news stories, in part because press releases mailed from Federal agencies to small papers outside Washington are both erratic and slow. Final copy is either reprinted wholesale from the wire services, moderately altered, or rewritten with local angles. The traditional wire services aim to satisfy broad audiences, often failing to cover stories of regional interest. Direct online access by small papers to Federal agencies could enhance local awareness of relevant national news.

While small papers could benefit substantially from the electronic receipt of Federal Government information, many are currently inhibited by a lack of data-carrying capacity and lack of financial and personnel resources to accommodate high-priced electronic offerings.

CHALLENGES TO GOVERNMENT/PRESS AUTOMATED DISSEMINATION

Need for Coordination

There is a clear need for better communication and coordination between those agencies choosing to disseminate press releases electronically. *FedNews*, offered through Dialcom, Inc., is the most significant effort at a consolidated Federal electronic news-release service to date. Eleven agencies currently offer news releases and other perishable information on *FedNews*, including: the USDA, Federal Communications Commission (FCC), Bureau of the Census, NASA, Food and Drug Administration, Department of Housing and Urban Development, Department of the Interior, U.S. Army, and Army Reserve. Releases are distributed unedited; agencies may determine the frequency and range of materials included. The *FedNews* menu allows materials to be searched by key words or dates; it can be scanned or read in full-text.

Decentralization in database and news-release distribution is a problem within and among agencies. All major agencies within USDA have created separate databases that could be made available online. Some of these are highly specialized. USDA's EDI system, the department's only online service consisting solely of perishable information, receives materials from roughly half of the USDA agencies.

Need for Improved Communication

Many newsroom librarians are inadequately informed about the availability of Federal electronic services, and there are no comprehensive indexes to Federal electronic services. A few agencies are aware of this problem and have made substantial efforts to stimulate public awareness. Both FEC and NLM (Grateful Med) have held press conferences on their online services, outlining their range of offerings, costs, and compatible computer systems.

Another communication gap exists between newsroom librarians and reporters. While librarians are interested in and trained in the retrieval of online information, many reporters remain uninterested or uninformed. As most reporters have not learned to use online services in daily reporting, library education and outreach must be energetic.

Still another communication gap lies between agency press offices and the private information providers who operate their services. Although service providers claim media subscribers, they rarely maintain adequate statistics to verify user numbers. Some providers sell first to "multiplexers" who then resell the services, making total client estimates increasingly difficult. Agencies could require that service firms track their clients more thoroughly and require that sales and customer statistics be provided.

Need for Completeness and Quality Control

Online databases may be incomplete or inconsistent in quality. Even on *FedNews*, participation by agencies varies. Some agencies use *FedNews* as a regular release mechanism (USDA updates its entries daily), while others use it as a supplemental service with only sporadic entries. Reporters tapping into *FedNews* might not understand these distinctions, and might find the service unreliable.

Private Contracting and Price Control

The tendency of private contractors to sell to other private vendors, or "multiplexers", can contribute to escalating prices and delays. Several issues need to be resolved: whether private vendors should be responsible for the delivery of public information and especially time-sensitive information like press releases; whether licensees or contractors own the value-added material they distribute; and whether agencies have the power to impose pricing or distribution requirements on licensees or contractors. Price escalation associated with the involvement of intermediaries could create pronounced inequities for small papers.

Potential Unavailability of Paper Copy

The absence of paper copies of press releases could present a problem for some news organizations. Several Federal press offices interviewed by OTA cited the Paperwork Reduction Act as the principal impetus for ventures into online news release distribution. Although most claim that online information is also available in paper format, this would seem to nullify some of the logic for initiating computerized distribution systems. Although it is clear that there is ample room for paperwork reduction in press release activities, reducing paper copies beyond a reasonable minimum could have a detrimental effect on the press, and particularly small papers that do not have electronic retrieval capabilities.

TECHNOLOGICAL AND STRATEGIC CHOICES

Technological Choices

Choosing new technological means to serve the press is not simply a decision for Federal agencies. Interest and technological readiness must be expressed by the media. In order to maximize the usefulness of new services, agencies must understand their potential clients.

The news media currently display wide-ranging levels of technological sophistication, varying according to type of media (newspapers, magazines, newsletters, wire services, radio, television broadcasters), size of firms, and ownership structures (group-owned versus independent). Media interest in new electronic services varies according to such factors as technological sophistication, proximity to Washington, and level of income.

In this era of technological transition, the most flexible services will be the most valuable. Some alternatives for delivery of information to the press are outlined below, along with a discussion of advantages and disadvantages to facilitate agency and congressional understanding.

Hard Copy Release

The most common form of transmitting newsworthy government information to the press involves the timed release of paper documents. When actively distributed, hard copy release is dependent on the mail or on messenger services and can be slower than electronic alternatives. It is necessary that paper releases remain available to serve recipients without computers.

Alternatives for hard copy release include:

- Hard copy releases sent by messenger or mailed to the press, accompanied by telephone "call-outs" to alert press about particularly important events;
- Hard copy releases deposited in agency press rooms for the newspapers' messengers to retrieve, or for use by in-house reporters. Hard copy mailings for out-of-State papers.

Computer-to-Computer Electronic Release

Computer-to-computer electronic mail is by far the most widely used electronic press release dissemination mode. The choice of electronic mail by most agencies probably results from the fact that this technology is becoming widely used for agency internal communications. Computer-to-computer electronic mail is not optimally suited to the press, however, as its contents are not immediately visible. To log onto an electronic mail system, searchers must dial a number, enter a code, and pay connect charges and hourly fees. Computers receiving mail-type messages are usually centrally located in newsroom libraries. As noted earlier, in order to control online costs, newspapers typically set up these systems so that access is not available from reporters' terminals. Electronic mail may not be practical for perishable releases that arrive at very irregular intervals.

Computer-to-computer electronic release is best suited for the provision of database services for research purposes. One advantage of electronic mail is that it allows for selectivity on the part of the reporter or researcher. Contents may be scanned for useful documents. Other advantages include archival capability and interactivity. Menu-driven systems can be divided into subject areas that can be scanned or reviewed in full-text form.

As mentioned earlier, electronic mail may be an important vehicle through which small papers can receive unfiltered news from remote locations. Full text databases for longer documents could place smaller papers on a par with larger papers that have easier direct access to the hard copy documents. While database services are impractical and often times too costly for reporters with daily deadlines, they can be of value for longer stories, or for newsletter, magazine, and trade publications.

Alternatives for disseminating releases via electronic mail include:

- direct online release into newsroom computers, through contracting agreements with private service firms (Dialcom, Inc., EDS, etc.);
- direct online release to multiplexers who offer subscriptions to service firms (EDI);
- hard copy release by agencies, with private firms placing information online and marketing services.

Wire Services

Wire service releases may be better suited to daily news-gathering than electronic mail, as they can eliminate the necessity of entering computer files to check for potential releases. Newswires can be received either directly through reporters' work stations or in hard copy form via teleprinters. Wire service release of hard copy is a practical way to handle irregular information flows, and reporters are accustomed to watching wire teleprinters for printouts.

Three existing alternatives for wire service transmission of government information include:

- Hard copy release by the agencies, picked up by independent wire services that transmit Federal information over telephone wires to newsroom computers or teleprinters (*US Newswire*). Fee for the agencies, free to the press.
- Hard copy transcripts of press briefings picked up by independent wire services that transmit Federal information by satellite to newsroom computers or teleprinters (*Federal News Service*); local transmission the carried out via FM sideband radios. Fee for the press, free for the agencies.
- Online release of information to independent wire services.

The first option has been adopted by *US Newswire*, founded in 1986 and currently serving almost 100 news media outlets in the Washington area. *US Newswire* transmits releases and advisories over dedicated data lines leased from the local telephone company, delivering releases via teleprinters installed in newsrooms or directly into newsroom computers. The teleprinter concept can eliminate the necessity of searching directories for news releases. The service is free to the media. Federal entities are charged per release, so this wire service tends to be used for announcements with significant time value.

About 80 percent of *US Newswire*'s clients have chosen the teleprinter mode of final delivery. Most newspaper bureaus use teleprinters, as do television and radio stations. *USA Today* has chosen to receive *US Newswire* along with other wire services such as AP and UPI into reporters' personal computers, while the *Post* has chosen to accept the wires via teleprinters, to avoid overuse of computers. *US Newswire* releases are saved for 24 hours, unless stored by reporters. *US Newswire* is distinguishable from traditional wire services in that it assumes no abstracting or editorial functions; it simply transmits releases as issued.

Several congressional offices are now offering information on *US Newswire*, along with the U.S. Information Agency, EPA, Department of Transportation (DOT), Department of Commerce, Department of Justice, DOI, HUD, and Department of Health and Human Services. The service currently costs $150 for a release to 100 media outlets (and $55 for release to a shorter list of 45 media outlets). This cost must be weighed against the cost of individual messenger-service runs to the media, and against message charges for electronic mail delivery.

The *Federal News Service*, another new wire service operation, uses a satellite to transmit daily briefings from Capitol Hill, the State Department, the Pentagon, and the White House to computers and teleprinters at media outlets. This is an expensive service for subscribers, yet *Newsweek* bureau personnel refer to it as "our life blood." Unlike the traditional wire services, *Federal News Service*, *US Newswire*, and similar services deliver briefings and speeches in unedited, full-text form. *Federal News Service* transcripts are placed online shortly after the time of release. The service will soon be available alternatively through Dialcom, Inc.

Bulletin Boards

Electronic bulletin boards have not been used extensively to inform the press about government activities. Within agencies, bulletin boards tend to be small, specialized, and little publicized. Bulletin boards may grow in importance in the future, for example to serve small newspapers wishing to be generally informed about a range of government activities, but not seeking Federal information on a regular basis.

Facsimile Transmission

Facsimile transmission allows for high speed relaying of individual messages to specific requestors. Facsimile is not appropriate for high-volume paper releases, but it is a necessary component of newsroom technology as it is widely used by those organizations that have not embraced full-scale electronic distribution technologies. Congressional offices, embassies, the Supreme Court, and the Pentagon all employ facsimile distribution.

Facsimile is theoretically well suited to the press because, like newswires, it delivers a tangible paper product that is visible upon delivery. However, the routine use of facsimile transmission is not expected because the machines tend to become overloaded with incoming messages at press deadline times. If newspapers are using facsimile machines to send their own documents, agencies will receive busy telephone signals and perhaps miss their own deadlines.

Electronic Mail or Wire Distribution with Some Abstracting and Printout Capability

The most suitable technology for distribution of perishable information to the press would appear to involve some combination of wire service and computer communications. A blending of electronic mail capabilities with the automatic printout capabilities of a wire message would be well suited to the needs of the press. Perhaps the best electronic option would involve the printing of short abstracts when news releases reach the receiving computer system (this type of approach is currently used by the Washington bureau of the *Wall Street Journal*, when receiving *US Newswire*). Such a system could combine the selectivity, interactivity, and flexibility of computer storage with the tangible, visible hard-copy product of a wire service. Computer-to-printer electronic mail technology is increasingly available in the agencies, but most media outlets do not receive releases in this manner. Ultimately, each agency must embrace a mix of technologies to fit the varying levels of technological sophistication of the media they hope to reach, and to match the types of messages they wish to relay.

Strategic Choices

If Federal agencies choose to distribute electronic press releases, they have several strategic options available to them, in addition to the technological choices outlined above. Criteria for evaluating the alternatives should address the potential problems and benefits for both agencies and the media.

Evaluation criteria for the media:

- cost;
- equity of access—services affordable to newspapers (and other media outlets) of different sizes;
- geographical flexibility—services extending to regional newspapers;
- speed—services received by papers in time for daily deadlines;
- accessibility—electronic press releases accessed in ways compatible with daily reporting activities;
- archival capability;
- thoroughness, uniform frequency, and centralization;
- flexibility of news releases (full-text databases, database-oriented perishable statistics); and
- maintenance of hard copy releases.

Evaluation criteria for Federal agencies:

- costs for electronic press releases versus costs of messenger-based and mail-based paper releases;
- interagency coordination in delivery of electronic press releases;
- extent of reach to media outlets—if service firms are involved, they should provide maximum coverage;
- ease of transmission; and
- speed of transmission.

As mentioned earlier, electronic distribution of government information to the press can have benefits in terms of speed, geographical coverage, archival capability, and selectivity. At the present time, however, electronic dissemination efforts by Federal agencies are limited. Among those involved in electronic dissemination, little communication or coordination has occurred. Further coordination and possibly centralization of these services would benefit agencies as well as the press.

Electronic press release services currently vary in quality, frequency, and technical and institutional frameworks for delivery. Different strategies for marketing and distribution have created disparities in pricing and limited access for small and regional papers. The technologies selected for dissemination could have a major impact on the types of news organizations that will benefit from these services.

Federal agencies may choose active or relatively passive roles in electronic dissemination. Regardless of the Federal role, private vendors, on their own initiative, are likely to continue to collect perishable Federal information and provide it to the press in several ways, including: online database services; wire service releases transmitted verbatim and unedited or abstracted and edited; and clippings services. However, if all electronic press release activities are left to the marketplace, news coverage may be incomplete. Some media organizations, particularly smaller low-budget companies, may be unable to afford marketplace electronic offerings.

To the extent that electronic distribution of news releases (and other time-sensitive information) is judged to be desirable, Federal agencies may choose from a spectrum of arrangements. Selected examples are outlined below:

1. *Exclusive agreements with single private vendors.* Vendors would charge agencies for online services and also charge media clients for connect time. A potential drawback is that Federal agencies could become locked into paying high fees, and prices could become prohibitive for some media groups. Also, sole contractors might receive competitive advantages perceived to be unfair by other vendors.
2. *Online delivery of information to multiplexers offering subscriptions to clients.* Clients would include information retailers and selected end users. Concerns about high fees and equity of access could surface here as well. In addition, client tracking could be difficult for agencies, and services might not reach intended media users.
3. *Contracts with selected service firms or multiplexers, supplemented by provision*

of online information to lower-cost distributors. Providing alternative access through lower-cost vendors such as The Source or Compu-Serve could help address concerns about high fees and equity of access. This scenario could still create concerns for competing vendors about unfair competition.

4. *Online provision of press releases to wire services.* This alternative might mitigate concerns about accountability, equity of access, and possibly high fees. It could also generate concerns about unfair competition.
5. *Direct provision of electronic information by Federal agencies.* In this scenario, agencies would place their news releases online and distribute them directly to media outlets. This could be fully or partially government subsidized. This alternative could help ensure accountability and equity of access. It could also raise concerns about governmental costs, unfair competition with private vendors, and possibly government manipulation or control of information.

Enhancing the effectiveness and equitability of electronic press release services will require the resolution of several important questions. One question is whether Federal agencies using sole contractors should be required to provide alternative access through lower-cost vendors. Another question is whether the use of intermediaries should be limited, in order to control costs and foster accountability. A third question involves pricing strategies. As noted earlier, pricing strategies vary significantly among the alternatives pursued to date. In the case of *U.S. Newswire*, Federal agencies pay for the service; the wires are free for the media. In the case of the *Federal News Service*, the media pay; the service is free to the government. Both the media and the government pay for both *Fednews* and EDI. A decision that needs to be resolved is whether agencies should be required to create tiered pricing systems, including some form of price cuts or subsidies for small media groups, depository libraries, or public interest groups. Still another unresolved issue is whether greater collaboration among agencies should be encouraged or required, in order to provide "one-stop-shopping" for the media. This might require standards for quality, consistency, and delivery formats. A final issue is the preservation of hard copy materials. Even if electronic press release services are widely adopted, dual format (paper and electronic) would appear to be necessary to ensure that those news outlets without, or lacking interest in, online capability are guaranteed access to traditional press releases and perishable data.

It is clear that the electronic delivery of time-sensitive information raises problems as well as opportunities for Federal agencies and other Federal entities. As the use of electronic delivery modes spreads throughout the Federal Government, attention should be directed to ensuring that new technologies serve their intended beneficiaries. A growing media interest in using electronic newsgathering techniques warrants further experimentation with new systems by executive agencies, as well as congressional offices and Federal courts. But a diversity in levels of interest, income, and automation in the press mandates that new strategies be flexible, multifaceted, and accommodating.

Chapter 11

Federal Information Dissemination Policy in an Electronic Age

Photo credit: Documents Center, Robert W. Woodruff Library, Emory University

User accessing Federal information via an online information system

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Chapter 11

Federal Information Dissemination Policy in an Electronic Age

SUMMARY

The rapid deployment of electronic information technologies by Federal agencies, as with all major sectors of American society, is generating a number of issues with respect to public policy on Federal information dissemination.

This chapter raises and examines several broad information policy issues. These include:

- congressional commitment to public access to Federal information;
- the need for revision of governmentwide information dissemination policy—particularly regarding cost-effectiveness, the role of the private sector, and electronic v. paper formats;
- the need for clarification of institutional roles and responsibilities; and
- improvements in information dissemination management.

These analyses are followed by a discussion of ways to improve conventional printing activities of the Federal Government with respect to cost, timeliness and quality, and estimating and billing procedures.

A fundamental cross-cutting issue is public access to Federal information. Debate over the use of electronic formats, privatization, and the like is obscuring the commitment of Congress to public access. Congress has expressed through numerous public laws the importance of Federal information and the dissemination of that information in carrying out agency missions and the principles of democracy and open government. A renewed commitment to public access in an electronic age may be needed.

Congress may wish to revise governmentwide information dissemination policy. In so doing, Congress would need to consider and reconcile several sometimes competing considerations including:

- enhancing public access,
- minimizing unnecessary overlap and duplication in Federal information activities,
- reducing unnecessary or wasteful Federal information activities,
- optimizing the use of electronic v. paper formats,
- and optimizing the role of the private sector.

The Office of Management and Budget (OMB) has promulgated its own view of appropriate public policy (in the form of OMB Circulars A-130 and A-76). The OMB view is controversial as it relates to Federal information dissemination. In the absence of clear and positive congressional direction, conflict and confusion are likely to continue. Congress may wish to amend specific statutes (including the Printing Act, Depository Library Act, and Paperwork Reduction Act), promulgate its own version of the basic principles addressed in A-130, and establish guidelines on the role of the private sector (including contracting out and provision of value-added information products). Congress could act on a governmentwide, agency-by-agency, or program-by-program basis.

Congress also may wish clarify the roles and responsibilities of Federal institutions involved with information dissemination, including mission agencies and governmentwide dissemination agencies such as the U.S. Government Printing Office (GPO) and National Technical Information Service (NTIS). The advent of numerous options for electronic dissemination has aggravated concerns about statutory authority (e.g., Printing Act v. Paperwork Reduction Act jurisdiction over electronic formats), separation of powers (e.g., legislative v. executive branch control over agency printing), procurement (Printing Act v. Brooks Act jurisdiction over electronic publishing systems), role of the private sector (e.g., privatization v. government incorporation of NTIS), and overall policy guidance (e.g., OMB v. Joint Committee on Printing [JCP] roles). These issues have led to various proposals for reorganization of government information dissemination institutions. In the absence of congressional direction, conflict and confusion are likely to continue.

OTA identified several alternatives for improvement of information dissemination management that could be implemented in the short-term by executive branch action using existing statutory authorities and with the concurrence of Congress, but with no required statutory action. Of course, one or any combination of these alternatives could be incorporated into a legislative package, as amendments to various statutes, should Congress determine that a stronger mandate is needed.

- There is a clear consensus that appropriate *technical standards* for electronic publishing and dissemination are essential if the government wishes to realize potential cost-effectiveness and productivity improvements. The National Bureau of Standards, (NBS), Defense Technical Information Center (DTIC) or another Department of Defense (DoD) component, and GPO could be assigned lead responbility to accelerate the ongoing standards-setting process, presumably incorporating accepted or emerging industry standards to the extent possible.
- There is also general consensus in and out of government for the establishment of a *governmentwide index* to major Federal information products—regardless of format—although there are differing views on how to implement an index. GPO and NTIS (or a Government Information Office, should one be established) with possible assistance from the private sector and information science community, could be assigned responsibility to consolidate and upgrade existing indices, directions, and inventories (including the results of OMB surveys) into one integrated index. The index could be made available in multiple formats and disseminated direct from the government as well as via the depository libraries and private vendors (perhaps in enhanced form).
- Federal agency officials expressed strong support for much improved mechanisms to exchange learning and experience about technological innovations. Information dissemination *innovation centers* could be designated or established in each branch of government, for example, at DTIC (for the defense sector), NTIS and/or NBS (for the civilian executive branch), and GPO (for the legislative branch), and under grant or contract to a university or other independent, nonprofit research center. Agencies could be required to conduct "agency X-2000" studies to creatively explore and develop their own visions of future information dissemination activities.
- Information dissemination is still not an effective part of agency information resources management (IRM) programs. A variety of IRM training, career development, budget, and management actions could be implemented to give information dissemination (including printing, publishing, press, public affairs, and the like) a stronger and better understood role within the IRM concept. Also, whether within the IRM concept or otherwise, Federal agency participation in *electronic press release* activities could be expanded with electronic releases provided directly to the press, to private electronic news and wire services and perhaps to depository libraries.

Finally, OTA identified several alternatives that could be implemented to improve the government's conventional ink-on-paper printing. Despite the rapid increase in electronic formats, there is likely to be significant, continuing demand for printed copies of a broad range of Federal reports and other printed materials. Thus, for at least the next 5 years and probably longer, there will be a need to continually improve the Federal Government's conventional printing.

Some Federal agencies have raised concerns about the cost, timeliness, and quality of GPO printing. Based on information available to OTA, the cost of GPO's procured printing appears to be competitive, and there appears to be no financial basis for dismantling the GPO printing procurement program. However, GPO main plant inhouse work is more expensive than procured work. There are several alternatives for reducing the cost to Federal agencies including: use of special rates, reducing indirect costs and overhead, and use of cost-saving technology. With respect to timeliness of GPO procured work, the overall data do not suggest a widespread delinquency problem. However, the percentage of delinquent printing jobs at the GPO main plant is two to three times higher than procured jobs. This warrants further evaluation to determine the extent of the problem and possibly to take action to smooth the work flow, encourage realistic delivery estimates, and limit priority work. With respect to quality of GPO printing, again, the overall data do not suggest a widespread problem, although the defect rate for inhouse work is somewhat higher than for procured work. Other areas that appear to be in need of improvement are cost estimating and billing procedures. Routine itemized billing warrants consideration.

There is need for even stronger cooperative working relationships between agency printers and publishers and GPO staff, and between publishers, printers, public information officers, financial and procurement officers, and the like within the agencies. Existing intra- and interagency advisory groups could be reviewed and strengthened and/or new groups established.

Other potential improvements in conventional printing identified, but not examined by OTA, include use of nonacidic paper, alternative printing inks, and expert systems software for printing management.

RENEWED COMMITMENT TO PUBLIC ACCESS

A major crosscutting issue for this study is public access to Federal information. In the broadest sense, all of the technical, institutional, and policy mechanisms discussed in previous chapters are intended to facilitate public access. The debate in recent years over cost-effectiveness, privatization, and the like has sometimes obscured the fundamental and enduring commitment of Congress and, indeed, of public law to the principle of public access. Information is the lifeblood of Federal Government programs and activities and is essential not only to the implementation of agency missions, but to informed public debate, decision, and evaluation concerning such programs and activities. Broad public access to such information has been established by Congress as a primary policy objective to be accomplished through a variety of information dissemination mechanisms, including government-initiated activities such as the GPO and NTIS document sales programs, the GPO depository library program (DLP), and citizen-initiated activities such as submitting FOIA requests.

The policy framework establishing public access as a goal of Federal information dissemination consists of both governmentwide and agency-specific statutes plus various legislative and executive branch directives, circulars, and guidelines.

Many governmentwide statutory provisions have been codified in Title 44 of the U.S. Code ("Public Printing and Documents"). Several key chapters of Title 44 include the following illustrative provisions:

- Chapter 1—establishes the JCP "to remedy neglect, delay, duplication, or waste in the public printing and binding and the distribution of Government publications." (44 U.S.C. 103).
- Chapters 3 and 5—establish GPO to be headed by the Public Printer; require that all printing, binding, and blank-book work for the Government be done at GPO, except as approved by the JCP; and authorize GPO to procure printing with approval of the JCP. (44 U.S.C. 301, 501, 502).
- Chapters 7 and 9—establish rules, procedures, and authorities for printing, binding, and distribution of congressional documents, including the *Congressional Record*, and specify responsibilities of the JCP and GPO, among others.
- Chapters 11 and 13—establish rules, procedures, and authorities for printing, binding, and distribution of executive and judicial branch documents.
- Chapter 15—establishes the Office of the *Federal Register* (now located in the National Archives and Records Administration [NARA]) and rules and procedures for preparation of the *Register* and printing by GPO.
- Chapter 17—establishes the Superintendent of Documents (SupDocs) within GPO and the rules, procedures, and authorities for SupDocs sale and distribution of public documents, preparation of an index to public documents and catalog of government publications, and international exchange of government publications;
- Chapter 19—establishes rules, procedures, and authorities for the DLP to be administered by the SupDocs.
- Chapters 21, 29, 31, and 33—establish rules, procedures, and authorities for the preservation of historical materials (e.g., books, documents, papers, maps) of the government, and for management, retention, and disposal of government records; assign responsibilities to the Administrator of General Services (GSA), Archivist of the United States, and Federal agencies; and assign administrative responsibility to the Archivist of the United States (and now NARA).
- Chapter 35—establishes rules, procedures, and authorities for coordination and management of Federal information policy relevant to the collection, maintenance, use, and dissemination of Federal information and the acquisition and use of automatic data processing and telecommunications technologies by the Federal Government; establishes the Office of Information and Regulatory Affairs (OIRA) in OMB; and assigns responsibilities to OIRA and Federal agencies.

Prior analyses by the Congressional Research Service (CRS) have found that Congress has enacted literally hundreds of specific laws that assign information collection, clearinghouse, directory, dissemination, and related functions to Federal agencies.[1] Some illustrative laws enacted by the 95th through 99th Congresses are shown in Table 11-1.

A review of prior OTA reports also revealed that information dissemination is an important aspect of many issues facing Congress, ranging from medical technologies to hazardous waste disposal to ocean resource management to energy conservation. Excerpts from selected OTA reports are capsulized in Table 11-2.

Congress frequently includes the establishment or strengthening of information dissemination (and related collection) mechanisms in legislative actions to address current problems, such as AIDS or international competitiveness. The CRS list of legislation introduced in the 100th Congress provides a further indication of congressional intent, as highlighted in Table 11-3.

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[1] Sandra N. Milevski and Robert L. Chartrand, "Information Policy: Legislation of the 95-98th Congresses, With Selected Bills of the 99th Congress," Congressional Research Service, June 1985; Sandra N. Milevski, "Information-Related Legislation of the 99th Congress," CRS, August 1986; Robert L. Chartrand, "Information Policy and Technology Issues: Public Laws of the 95th through 99th Congresses," CRS, February 1987.

Table 11-1.—Illustrative Public Laws Relevant to Information Dissemination, 95th Through 99th Congresses

Public Laws (relevant provisions in capsule form)
95th Congress
P.L. 95-87, Surface Mining Control and Reclamation Act, to establish a surface coal mining and reclamation information clearinghouse.
P.L. 95-166, National School Lunch Act and Child Nutrition Amendments, to disseminate nutrition information.
P.L. 95-267, National Climate Program Act, to gather and disseminate national and international climate data.
P.L. 95-273, Ocean Pollution Research and Monitoring Program Act, to establish an ocean pollution information system.
P.L. 95-307, Forest and Park Rangeland Renewable Resources Research Act, to disseminate scientific information on all aspects of forest and rangeland renewable resources.
96th Congress
P.L. 96-302, Small Business Administration (SBA) Authorization Act, SBA to create a small business economic database and publish economic indices.
P.L. 96-345, Wind Energy Systems Research, Development, and Demonstration Act of 1979, Department of Energy (DOE) to collect, evaluate, and disseminate data on wind energy systems.
P.L. 96-374, Education Act Amendments of 1980, Dept. of Education to establish an information clearinghouse for the handicapped.
P.L. 96-399, Housing and Community Development Act of 1980, Department of Housing and Urban Development (HUD) to collect and report data on sales prices for new homes.
P.L. 96-482, Solid Waste Disposal Act Amendments of 1979, Environmental Protection Agency (EPA) to collect, maintain, and disseminate information on energy and materials conservation and recovery from solid waste.
97th Congress
P.L. 97-88, Energy and Water Development Appropriations Act of 1982, Department of the Interior (DOI) to prepare and disseminate information on recreational uses of reservoir areas and archeological remains in such areas.
P.L. 97-98, Agriculture and Food Act, U.S. Department of Agriculture to develop an agricultural land resources information system and to establish relations with foreign agricultural information systems.
P.L. 97-290, Export Trading Company Act of 1982, Dept. of Commerce to disseminate information on export trading.
P.L. 97-292, Missing Children Act, Attorney General to acquire and exchange information to help identify and locate certain deceased individuals and missing children.
98th Congress
P.L. 98-24, Alcohol and Drug Abuse Amendments of 1983, Department of Health and Human Services (HHS) to disseminate information regarding health hazards of alcohol and drug abuse.
P.L. 98-362, Small Business Computer Crime Prevention Act, SBA to establish an information resource center on computer crime.
P.L. 98-373, Arctic Research and Policy Act of 1982, to establish data collection and retrieval center for arctic research and to promulgate guidelines for use and dissemination of such information.
99th Congress
P.L. 99-412, Conservation Service Reform Act of 1985, DOE to disseminate information annually to states and public utilities on residential energy conservation.
P.L. 99-570, National Antidrug Reorganization and Coordination Act, HHS to establish a clearinghouse for alcohol and drug abuse information.

SOURCE: R.L. Chartrand, Congressional Research Service, 1988.

There is a history of congressional actions to institutionalize information dissemination functions, as illustrated by the establishment of the Library of Congress in 1800, the Federal Depository Library Program in 1813, the Library of the Surgeon General's office in 1836 (later to become the National Library of Medicine [NLM]), the GPO in 1860, National Agricultural Library (NAL) in 1862, and NTIS in 1970. In addition, Congress has articulated the importance of access to and dissemination of public information in enacting, for example, the Printing Act of 1895 (recodified in 1968 as Part of Title 44 of the U.S. Code), Depository Library Act of 1962, Freedom of Information Act of 1966, Public Law 91-345 establishing the National Commission on Libraries and Information Science in 1970, Federal Program Information Act (P.L. 95-220, creating a database on Federal domestic assistance programs), and Paperwork Reduction Act in 1980 (codified as part of Title 44).

Thus, taken as a whole, congressional intent with respect to Federal information is clear. In general, unimpeded dissemination of and access to Federal information is encouraged or frequently required and is vital to performance of agency and programmatic missions established by statute as well as to the principles of open government and a democratic society.

Despite the breadth and depth of legislated congressional commitment to Federal information dissemination and the overriding goal of

Table 11-2.—Illustrative OTA Report Excerpts Relevant to Information Dissemination

Starpower: The U.S. and International Quest for Fusion **(October 1987)**
Effective exchange of information on research in progress, technical know-how, experimental data, and the like would minimize unneccessary duplication of effort and increase the probabilities of scientific or technical breakthroughs.

Technologies for the Preservation of Prehistoric and Historic Landscapes **(July 1987)**
A national computerized database of identified historic landscapes would help increase awareness, management, and conservation of historic landscapes and facilitate identification of as yet uncatalogued landscapes.

Marine Minerals: Exploring Our New Ocean Frontier **(July 1987)**
Better coordinated policy on archiving and disseminating oceanographic data and upgrading of oceanographic data centers would help make such data more readily available to a wide range of potential users.

Technologies to Maintain Biological Diversity **(March 1987)**
The quality of data on biological diversity is uneven for different parts of the world, due in part to data being collected for different purposes, stored in different forms, and scattered among different institutions. An information clearinghouse with integrated databases on biological diversity would enhance access to and use of the data and reduce duplication of effort.

Transportation of Hazardous Materials **(July 1986)**
Lack of adequate information about transport of hazardous materials is one key factor contributing to accidents and the resultant injuries and environmental damage. Federal, State, and local governments need improved information systems to help set regulations, reduce high-risk accident potential, target enforcement efforts, and plan for effective emergency response when accidents do occur.

Alternatives to Animal Use in Research, Testing, and Education **(February 1986)**
The sharing of information on animal-based research and testing is vital to scientific progress. A computer-based registry of research and testing would help decrease the use of animals by reducing unintentional duplication of effort, facilitate new kinds of data analyses, and save time and money.

SOURCE: Office of Technology Assessment, 1988.

public access, major policy issues have developed in several different areas. This is especially true with respect to the use of electronic information technologies.

Based on the results of commissioned research, surveys, and various outreach activities conducted as part of this assessment, significant segments of the interested public desire access to Federal information in electronic formats where it is appropriate, useful, and cost-effective. The results of the GAO survey of Federal information users, as detailed in chapter 4, confirm this desire. Overall, the library, research, media, public interest, consumer, business, State/local government, and physically handicapped communities, among others, support the principle of public access to Federal information regardless of formats.

However, many of these groups believe that Federal information users are increasingly disadvantaged to the extent Federal information in electronic form is not available through the normal governmentwide dissemination channels and/or that there are significant barriers to access to Federal electronic information. They argue that the Federal Government has a responsibility to assure equity of access to Federal information in electronic formats as well as in paper, to the degree that electronic formats offer significant cost or usefulness advantages.

Consumer, library, and public interest groups also have expressed concern about the decline in availability of and increase in user charges for Federal information products and services. Both the number of total and the number of free Federal publications appears to have declined over the past decade, and many agencies have adopted some form of marginal cost recovery as the basis for pricing agency publications and other information products or services.

Congress may wish to consider making a renewed commitment to the overriding goal of public access and perhaps even a reaffirmation of principles established by Congress in previous statutes but updated to reflect the increasingly electronic nature of Federal information.

CLARIFICATION OF GOVERNMENTWIDE INFORMATION DISSEMINATION POLICY

Over the last decade implementation of the overall goal of public access to Federal information has been complicated by several sometimes competing public policy goals with respect to cost-effectiveness of Federal information activities. These include a desire to:

- minimize unnecessary overlap and duplication in Federal information activities;
- reduce unnecessary or wasteful Federal information activities; and
- optimize or (in the opinion of some stakeholders) maximize the role of the private sector.

Table 11-3.—Selected Legislation Introduced in the 100th Congress Relevant to Information Dissemination

Bill Number	Title and/or description
H.R. 393/S. 1354	National Biotechnology Information Act of 1987 to establish the National Center for Biotechnology Information within the National Library of Medicine.
H.J. Res. 370	Directs the Secretary of Transportation to develop airline safety indicators and provide such information to the public.
H.R. 1/S.1	Water Quality Act of 1987 directs EPA to fund a National Clearinghouse on Small Flows (of sewage), and to collect and disseminate research and other information on the environmental quality of the Chesapeake Bay.
H.R. 407	National Home Health Clearinghouse Act of 1987 to establish a clearinghouse to collect and disseminate information on home health care for the elderly.
H.R. 2800	Directs EPA to collect and disseminate information on reduction of toxic chemical emissions.
S. 1429	Directs EPA to establish a clearinghouse on waste reduction.
S. 744	Directs EPA to develop and implement an information clearinghouse and national database on the location and amounts of radon.
H.R. 1407	Directs the Secretary of Trade (created in this bill) to develop and maintain a system to collect and disseminate information on international trade.

SOURCE: R.L. Chartrand and E. Baldwin, Congressional Research Service, 1988.

The goal of public access is complicated by the lack of clear congressional guidance on the use of electronic, v. paper formats in Federal information dissemination activities, and how goals of public access and cost-effectiveness are to be reconciled. OMB has promulgated its own view of appropriate public policy, but the OMB view is controversial and, as discussed below, not necessarily consistent with at least what can be reasonably inferred from a variety of congressional actions. However, absent a clear and positive congressional clarification, probably in statutory form, conflict and confusion are likely to continue.

Cost-Effectiveness

Both the legislative and executive branches of government have expressed concern about whether electronic information technologies are being deployed by the Federal Government in a cost-effective manner. There are several subelements to this issue. One is simply the need to minimize overlap and duplication in technology-based Federal information activities through effective management and coordination. The Paperwork Reduction of Act of 1980 was directed in large part at this problem, and required that OMB, through OIRA and the major executive agencies, implement an integrated approach to planning for and managing information resources. This has become known as the Information Resources Management (IRM) concept, and all major agencies have since designated "senior IRM officials." While the legislative history of the Paperwork Reduction Act indicates that information dissemination was intended to be covered, the language of the act as originally enacted was ambiguous. However, 1986 amendments to the Paperwork Reduction Act explicitly included "information dissemination" in the statutory language.[2]

One purpose of the amended Paperwork Reduction Act is, "to maximize the usefulness of information collected, maintained, and disseminated by the Federal Government." And the authority and functions of the OIRA Director and of Federal agencies extend to "sharing and dissemination of information."[3]

A second aspect of concern about cost-effectiveness involves reducing unnecessary or wasteful Federal information activities. The Paperwork Reduction Act is clear in its intent that the government's information collection burden on the public be reduced, reflecting the presumption that government information collection activities were, at least at that time, uncoordinated and included a significant portion of unnecessary collection requests. The Act is silent on reduction of information dissemination activities. Also, the Deficit Reduction Act of 1984 called for reductions in certain Federal publishing, public affairs, and audio-visual activities. Some cuts were made in response to the Act and as part of OMB's general initiative to reduce fraud, waste, and abuse. OMB claimed that about 4,000 government publications were eliminated or consolidated by 1985 and that more than 100 agency printing/duplicating plants had been eliminated or consolidated (out of about 850 agency plants operating in the continental United States and another 200 overseas).[4] GPO had provided OMB with recommendations for the consolidation, downgrading, or closure of 250 of these plants, of which 70 were ultimately closed. OMB concluded in 1985 that any further significant reductions in publishing and related activities would compromise essential agency missions.[5]

Neither the Paperwork Reduction Act nor the Deficit Reduction Act explicitly mention reductions in electronic information dissemination activities. Current OMB officials concur that the Paperwork Reduction Act does not provide guidance on electronic (or any) information dissemination. Indeed, according to Dr. Timothy Sprehe of OMB:[6]

> While the Paperwork Reduction Act in several places uses the term "dissemination," neither in that act nor elsewhere has Congress given the executive branch a single comprehensive set of statutory directions regarding responsibilities of all Federal agencies for actively disseminating Government information. Put another way, the Paperwork Reduction Act provides fairly explicit statutory policy regarding information input to Government—controlling the collection of information and imposition of record-keeping requirements—but says little regarding information output from Government.

The act and its legislative history do articulate congressional intent to maximize public access to government information. For example, the original purpose of the act was, among other things, "to maximize the usefulness of information collected by the Federal Government" (and extended to specifically include information maintained and disseminated, per the 1986 amendments as noted earlier)[7]. The Senate report accompanying the original act stated that "the Committee expects the Director [of the Office of Information and Regulatory Affairs] to take appropriate steps to maximize public access to the information the Federal Government collects."[8] Also, the Federal Information Locater System, which the original act required OMB to establish, was intended to help serve this purpose.[9] The 1986 amendments further strengthened this statutory requirement. However, it is correct that the act does not provide the kind of detailed guidance on information dissemination that was provided on information collection.

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[2] U.S. Congress, Continuing Appropriations Resolution for Fiscal 1987, Title VIII, "Paperwork Reduction Reauthorization," Sec. 811 which amends 44 U.S.C. 3501(3), 99th Congress, 2nd sess., pp. 350, 351, 353.

[3] Ibid

[4] Office of Management and Budget, *Management of the United States Government, Fiscal Year 1986*, January 1985, and OMB, *Managing Federal Information Resources*, June 1984.

[5] Ibid., *Management.*

[6] J. Timothy Sprehe, "Developing Federal Information Resources Management Polity: Issues and Impact for Information Managers," *Information Management Review*, vol. 2, No. 3, 1987, p. 37; see generally pp. 33-41.

[7] 44 U.S.C. 3501 (3).

[8] S. Rep. No. 96-930, p. 3.

[9] 44 U.S.C. 3501 (2) B and (D).

A third part of the concern about cost-effectiveness involves the role of the private sector. Pursuant to the Paperwork Reduction Act, OMB has promulgated Circular A-130 on "Management of Federal Information Resources." A-130 emphasizes the role of the private sector in information dissemination activities. The history of A-130 is informative. The draft circular, formulated after a public input process, strongly emphasized reliance on the private sector and user charges. For example, the draft circular recognized that government information dissemination could be necessary and even essential to agency missions. But the draft circular would have permitted such dissemination by the government only if the information product or service was not already provided by other government or private sector organizations or could reasonably be provided by such organizations in the absence of agency dissemination.[10] Moreover, while the draft circular noted that dissemination should be conducted "in a manner that reasonably ensures the information will reach . . . the public . . .," the draft circular required that "maximum feasible reliance" be placed on the private sector for dissemination and that the costs of dissemination be recovered through user charges, where appropriate.[11]

The draft circular proved to be controversial, and numerous objections were received. The final version of the circular, issued by OMB in December 1985, gives more explicit recognition to the importance of government information. For example, the circular states that "government information is a valuable national resource," and "[t]he free flow of information from the government to its citizens and vice versa is essential in a democratic society . . ."[12] The circular still emphasizes the role of the private sector. Federal agency dissemination must be either "specifically required by law" or "[n]eccessary for the proper performance of agency functions," provided that the information products and services disseminated "do not duplicate similar products or services that are or would otherwise be provided by other government or private sector organizations."[13] The circular requires that "maximum feasible reliance" be placed on the private sector for dissemination, and that costs be recovered through user charges, where appropriate.[14]

The statutory authority for the information dissemination provisions of OMB circular A-130 appears to be unclear. While much of the circular clearly is responsive to the Paperwork Reduction Act, the act does not specifically speak to the role of the private sector or user charges in Federal information dissemination. While the act does assert the need to minimize the cost to the government of collecting, using, and disseminating information, the act does not address how this need should be met.

The cost recovery provision of OMB Circular A-130 was and is controversial, and is widely interpreted by agencies as strongly encouraging, if not requiring, user charges for information dissemination. However, a careful reading of A-130 indicates that:

- the decisions on pricing are left up to the discretion of agency heads;
- the user charge where applied should be set to recover the cost of information reproduction or dissemination only and not the cost of collecting or creating the information;
- user charges should take into account both the nature of the agency mission and client groups; and
- user charges can be waived or eliminated if necessary to carry out mission objectives.

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[10] Office of Management and Budget, "Management of Federal Information Resources," *Federal Register*, vol. 50, No. 51, Mar. 15, 1985, Sec. 8(a)8.

[11] Ibid., Sec. 8(a)(g). For further discussion, see Harold C. Relyea, Jane Bortnick, and Richard C. Ehlke, *Management of Federal Information Resources: A General Critique of the March 1985 OMB Draft Circular—Matters for Possible Congressional Consideration*, Congressional Research Service, Library of Congress, July 5, 1985.

[12] Office of Management and Budget, Circular No. A-130, "Management of Federal Information Resources," Dec. 12, 1985, Secs. 7(a) and (b).

[13] Ibid., Secs. 9(a) and (b).

[14] Ibid., Secs. 11(b) and (c).

In effect, OMB policy on user charges permits the individual Federal agencies considerable latitude as to pricing of Federal information dissemination regardless of format. In promulgating A-130, OMB applied the philosophy of OMB circular A-25 regarding user charges for government goods and services in general to information dissemination in particular. (Note that OMB has issued a draft revision to A-25.) Similarly, OMB applied the philosophy of OMB circular A-76 regarding contracting out of commercially available services in general to information dissemination in particular.[15]

The private sector already has a major role in Federal information dissemination. A key issue is how this role relates to the government goal of access broadly defined.[16] The private sector traditionally has a major role as contractor to the government for a wide range of services, some of which are information related. Both the Printing Act (P.L. 90-620) and the Brooks Act (P.L 89-306), and their implementing guidelines, facilitate contracting out of Federal printing and computer-related activities. Private sector printing contracts through the GPO are averaging about $600 million annually, and private sector information technology contracts through GSA and the line agencies are averaging, conservatively, $8 billion annually (for hardware, software, and services).

Over the past 5 years, an estimated $3 billion in printing contracts and $40 billion in information technology contracts have been awarded to the private sector. Much of the information technology contracting is for the general information infrastructure of the Federal Government. The fraction devoted directly or indirectly to information dissemination functions is not known, since the OMB and agency IRM budgets and plans do not collect or provide financial data by type of application. The 114 civilian departmental agency components responding to the GAO survey reported collectively an average of $1.1 billion annually for fiscal year 1983 through fiscal year 1987 in private sector contracting for information clearinghouse operations. The extent of overlap between this figure and the IRM figures is unknown. Recent automation programs for information dissemination-related activities at agencies such as the Securities and Exchange Commission (SEC) and Patent and Trademark Office (PTO) have included private sector contracting in the range of tens to hundreds of millions of dollars per agency. In addition to its role as a government contractor, the private sector is a major user and reseller of Federal information, as will be discussed later in this chapter.

Electronic v. Paper Formats

The second major issue cluster involves the applicability of the existing statutory framework and implementing directives to electronic as opposed to paper forms of information dissemination. As noted earlier, the Paperwork Reduction Act provides little substantive guidance on electronic information dissemination. Unfortunately, the two other critically important statutes, the Printing Act and Freedom of Information Act, were enacted in 1895 and 1966 respectively, and both predated the era of widespread electronic information exchange. Neither has been updated to reflect electronic formats; as a result, there is considerable controversy about their applicability to electronic formats. Much of the debate turns on such narrow questions as whether terms such as "printing," "publication," "record," and "document" are to be interpreted as limited to paper formats or to include relevant Federal information regardless of format.

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[15] Sprehe, footnote 6, op. cit., pp. 38-39; and Office of Management and Budget, "Draft Revision of OMB Circular A-25 on User Charges," *Federal Register*, vol. 52, No. 126, July 1, 1987, pp. 24890-24892.

[16] There have been numerous prior studies on this general topic. See, for example, U.S. National Commission on Libraries and Information Science, *Public Sector/Private Sector Interaction in Providing Information Services*, February 1982; U.S. Congress, House of Representatives, Committee on Government Operations, Subcommittee on Government Information and Individual Rights, *Government Provision of Information Services in Competition With the Private Sector*, 97th Congress., 1st Sess., Feb. 25, 1982; U.S. Congress, Office of Technology Assessment, *MEDLARS and Health Information Policy*, OTA-TM-H-11, U.S. GPO, Washington, DC, September 1982; U.S. Library of Congress, Network Development Office, *Public/Private Sector Intersactions: The Implications for Networking*, prepared by the Network Advisory Committee, 1983; U.S. National Commission on Libraries and Information Science, *Information Policy Implications of Archiving Satellite Data: To Preserve the Sense of Earth from Space*, Washington, DC, 1984; U.S. Congress, Office of Technology Assessment, *Remote Sensing and the Private Sector: Issues for Discussion*, OTA-TM-ISC-20, U.S. GPO, Washington, DC, March 1984; and Peter Hernon and Charles R. McClure, *Federal Information Policies in the 1980's: Conflicts and Issues*, Ablex Publishing, Norwood, N.J., 1987.

Today, most Federal agencies are operating in a partial policy vacuum when it comes to electronic information dissemination. In addition to the confusion and controversy over governmentwide statutory application, the results of the GAO survey indicate that the majority of agencies do not have documented policies or procedures on providing public access to electronic databases, on the electronic dissemination of information by agency contractors, or on the applicability of FOIA to public information in electronic formats. The results are highlighted in Table 11-4 for 114 civilian departmental agency components and 48 independent civilian agencies.

The absence of explicit, governmentwide policy on electronic information dissemination is recognized by key legislative and executive branch officials. As early as the late 1970s, the JCP recognized the need to review and possibly update the Printing Act with respect to electronic printing and dissemination. In 1979, the JCP issued a comprehensive overview of a wide range of relevant issues.[17] In the early 1980s, the JCP initiated a revision of the *Government Printing and Binding Regulations* to deal in part with technological change.[18] While the revision effort did not come to fruition, the JCP did issue a requirement in 1985 that agencies submit to the JCP comprehensive printing program plans that included new technology.[19] Also during this time period, the JCP actively explored the provision of electronic formats to the depository libraries, and issued two reports on this topic.[20]

Table 11-4.—Federal Agency Policies on Electronic Information Dissemination

	Percent of agencies having documented policies and procedures	
Policy area	Departmental[a]	Independent[b]
Public access to agency electronic databases		
yes	9.6	10.4
no	90.4	89.6
Electronic dissemination by agency contractors		
yes	7.9	6.3
no	43.0	41.7
do not use contractors	49.1	52.1
Applicability of FOIA to electronic formats		
yes	18.4	25.0
no	81.6	75.0

[a] Departmental civilian agency components.
[b] Independent civilian agency components.

SOURCE: GAO Survey of Federal Agencies, 1987.

In 1986, the Senate Committee on Governmental Affairs introduced legislation to amend the Paperwork Reduction Act to provide much clearer guidance on information dissemination.[21] A few of the relevant provisions were incorporated in the Paperwork Reduction Act Amendments enacted by Congress at the close of the 99th Congress. Also, in 1986, the House Committee on Government Operations issued a comprehensive report and policy overview of issues pertaining to electronic collection and dissemination of Federal information.[22] The

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[17] U.S. Congress, Joint Committee on Printing, *Federal Government Printing and Publishing: Policy Issues*, Report of the Ad Hoc Advisory Committee on Revision of Title 44, U.S. Government Printing Office, Washington, DC, 1979. Also see U.S. Congress, Joint Committee on Printing, *The Printing Procurement Program of the Federal Government*, Report of the Task Force on the Printing Procurement Program, 99th Congress, 1st sess., Washington, DC, U.S. Government Printing Office, 1986.

[18] Memorandum to Heads of All Federal Departments and Agencies from Rep. Augustus F. Hawkins, Chairman, Joint Committee on Printing, U.S. Congress, June 20, 1983; Also see U.S. Congress, Joint Committee on Printing, "Revisions to Printing and Binding Regulations of the Joint Committee on Printing," 130 *Congressional Record*, P. H7075 ff., June 26, 1984.

[19] Memorandum to Heads of All Federal Departments and Agencies from Sen. Charles McC. Mathias, Jr., Chairman, Joint Committee on Printing, U.S. Congress, Sept. 23, 1985.

[20] U.S. Congress, Joint Committee on Printing, *Provision of Federal Government Publications in Electronic Format to Depository Libraries*, 98th Congress, 2d sess., U.S. GPO, Washington, D.C., 1984, and *An Open Forum on the Provision of Electronic Federal Information to Depository Libraries*, 99th Congress, 1st sess., U.S. GPO, 1985.

[21] U.S. Congress, Senate, S. 2230, "Federal Management Reorganization and Cost Control Act of 1986," Mar. 26, 1986, and especially Title VI on Federal Information Policy.

[22] U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture, *Electronic Collection and Dissemination of Infor-*

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report was prepared by the Subcommittee on Government Information, Justice, and Agriculture based in part on hearings that explored early agency initiatives in electronic dissemination. Subsequently, the House Committees on Government Operations, Energy and Commerce, and the Judiciary have collaborated on statutory language to address issues raised by SEC and PTO automation plans that affect access to and dissemination of agency information. In 1987, the JCP passed resolutions authorizing and encouraging the GPO to offer electronic formats and services and to conduct appropriate pilot tests. A few agencies, such as the Department of Commerce (DOC), have initiated internal task forces to address electronic dissemination policy issues. (The DOC task force recently issued a draft policy on electronic dissemination.)

Also, in 1987, OMB issued Bulletin No. 87-14 which directed all executive departments and agencies to inventory their information dissemination products and services, and report the results to OMB.[23] This bulletin essentially revises OMB Bulletin 86-11 on government publications to include electronic formats, such as machine-readable data files (e.g., magnetic tapes, floppy disks, software, online electronic databases, and electronic bulletin boards). In addition to activity reports, agencies are directed to establish and maintain electronic inventories of all information dissemination products and services, and to make these inventories available to the public. Agencies may provide these inventories either directly, as long as there is no duplication with other agency or private sector offerings, or indirectly through other agencies or private sector entities. The agency responses to this bulletin have not yet been released by OMB. OMB has issued:[24]

- a draft policy on electronic information collection or filing, which is relevant since electronic collection and dissemination can be part of the same system; and
- a draft policy on Federal statistical activities, which states that agencies are expected to conform to A-130 with respect to dissemination of statistical information.

Another example of ambiguity and controversy about statutory applicability concerns the Depository Library Act of 1962. Both this act and the related Printing Act of 1895 predate electronic dissemination and use conventional paper-based terminology. The word "electronic" does not appear in these acts. However, the legislative history of the Depository Library Act of 1962 can be interpreted to suggest that congressional intent was inclusive with respect to government information (see chs. 6 and 7 for further discussion). While the primary formats available at the time of enactment were traditional paper-based reports, publications, and documents, historical debate suggests that new formats could and should be accommodated. Indeed, microfiche is now a well established part of the depository program. Moreover the JCP, as noted earlier, has instructed the GPO (and, by extension, the depository program run by GPO) to include electronic formats. OMB, in circular A-130, directed agencies to provide all publications to depository libraries via GPO, but explicitly used the definition of "publication" (informational matter published as an individual document) found in the 44 USC 1901 rather than the broader term "information" (informational matter in any medium, including computerized databases, microform, or magnetic tape, as well as paper) used elsewhere in

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mation by Federal Agencies: A Policy Overview, House Report 99-560, 99th Congress, 2d sess., U.S. GPO, Washington, DC, Apr. 29, 1986. Also see U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information and Individual Rights, *Government Provision of Information Services in Competition With the Private Sector*, Hearing, 97th Congress, 2d sess., U.S. GPO, Washington, D.C., Feb. 25, 1982; and Rep. Glenn English, "Electronic Filing of Documents With the Government: New Technology Presents New Problems," *Congressional Record—House*, Mar. 14, 1984, H 1614-1615.

[23] Office of Management and Budget, "Report and Inventory of Government Information Dissemination Products and Services", OMB Bulletin No. 87-14, June 8, 1987.

[24] Office of Management and Budget, "Notice of Policy Guidance on Electronic Collection of Information," Aug. 7, 1987, printed in *Federal Register*, vol. 52, pp. 29454-29457; OMB, "Summary of Comments on Notice of Policy Guidance on Electronic Collection of Information," Nov. 17, 1987; OMB, "Notice of Draft Circular Establishing Guidelines for Federal Statistical Activities," *Federal Register* vol. 53, No. 12, Jan. 20, 1988, pp. 1542-1552.

A-130. Also, in Bulletin 87-14, OMB excluded electronic formats from the agency reporting requirements for materials provided to the depository library program.

In sum, OMB appears to have reservations or at least be quite uncertain about whether and to what extent electronic formats should be included in the depository library program. In sharp contrast, the chairman of the JCP has stated that:[25]

> When a Federal agency publishes Government information in electronic format for mass or general distribution, whether as a complement to or as a substitute for conventionally printed material, the GPO should and must continue to provide its full range of services and support in the production, distribution, and sale of such publications. This, of course, includes the distribution of such electronic Government publications to depository libraries.

One final example of ambiguity over statutory applicability to electronic formats involves the Freedom of Information Act (FOIA). Enactment of FOIA in 1966 shifted the burden of proof from the public to Federal agencies when questions of access to Federal information are in dispute. The act served to establish full agency disclosure as the operating principle, unless information was in one of the categories (e.g., classified, proprietary) specifically exempted. The advent of electronic information technology largely postdated the act and, as a result, numerous issues have arisen in the agencies and the courts. For example, what is a "reasonable" search for the desired information when the information is in electronic form and the search can be conducted in a computer-assisted fashion? What is the definition of an agency "record" when a record could be in a machine-readable format such as a database, floppy disk, or optical disk? If computer software is needed to access electronic agency information effectively, does or should the software be defined as an integral part of the agency record and of a reasonable search? Does a legal agency record exist when the record has never been (and may never be) in hardcopy paper format? These and other questions present a growing challenge to the interpretation of FOIA in an increasingly electronic environment. In many areas, the FOIA case law on electronic formats is limited, ambiguous, or contradictory, and the courts have suggested the need for legislative remedies (see ch. 9).

Possible Congressional Actions

If Congress wishes to preserve and strengthen the principle of public access to Federal information, a number of possible actions warrant consideration. These range from amending specific statutes with respect to electronic formats, to articulating an overall statement of congressional intent.

For example, if Congress wishes to maintain the integrity of FOIA for electronic as well as traditional paper formats, the option of amending the statute deserves serious consideration and, indeed, may well be essential. Various specific electronic FOIA issues that could be addressed by amendments are discussed in some detail in chapter 9.

Similarly, if it is, congressional intent that the DLP should include Federal information in all formats, then Congress may need to amend appropriate statutes to eliminate the current ambiguity and controversy. Various specific depository library issues that could be addressed are discussed in detail in chapter 7.

Another congressional action that warrants serious consideration is the promulgation of congressional views, perhaps in statutory form, on the information dissemination principles addressed in OMB's Circular A-130. The most important contribution could be to establish a clearer sense of congressional priority with respect to public access and cost-effectiveness goals. A central question is—which comes first, if choices must be made. For example, one possible interpretation of congressional intent regarding Federal information dissemination is to give highest priority to unimpeded and open dissemination in order to realize the overriding policy goal of public access. This could be achieved as cost-effectively as possible without compromising public access, and utilizing the private sector where appropriate as one means to achieve these ends. This interpretation is philosophically somewhat different from that reflected in OMB Circular A-130, and also from OMB Circular A-76 which requires contracting out of commercially available services when cost-effective to the government. Note that the applicability of A-76 to arguably inherent governmental functions such as information dissemination, and the cost-effectiveness of private contracting of such functions, are also in dispute. These topics are considered below and in chapter 12 under the discussion of possible privatization of NTIS or GPO. Given the potentially conflicting interpretations of congressional intent, congressional clarification or reaffirmation appears warranted, possibly through amendment of relevant statues such as the Printing Act or Paperwork Reduction Act.

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[25] Letter from Honorable Frank Annunzio, Chairman, Joint Committee on Printing, to Honorable Ralph E. Kennickell, Jr., Public Printer, Mar. 25, 1988.

Congress may need to clarify its intent about whether and under what conditions privatizing Federal information dissemination functions is appropriate given the vital governmental nature of many dissemination activities, and whether and under what conditions privatizing is cost-effective.

OMB Circular A-76 on "Performance of Commercial Activities" (August 4, 1983) states that the "Federal Government shall rely on commercially available sources to provide commercial products and services . . . if the product or service can be procured more economically from a commercial source . . . [and is not] inherently governmental in nature." Circular A-76 defines a governmental function as "so intimately related to the public interest as to mandate performance by Government employees" such as:

- management of government programs requiring value judgements;
- selection of program priorities;
- direction of Federal employees;
- regulation of the use of space, oceans, navigable rivers, and other natural resources; and
- regulation of industry and commerce.

A-76 does not specifically address whether information dissemination is a governmental function in this sense. However, A-76 does list the following information-related activities as being commercial not governmental in nature, along with numerous other activities illustrated below:

Information-Related
    Distribution of audiovisual materials
    Library operations
    Cataloging
    Printing and binding
    Reproduction, copying, and duplication
    Management information systems
Other
    Operation of cafeterias
    Laundry and dry cleaning
    Architect and engineer services
    Operation of motor pools
    Word processing/data entry/typing
    Laboratory testing services

A-76 does point out that whether or not these (or other commercial) activities serve inherently governmental functions and should be performed by the government, there should be analyses and decisions on a case-by-case basis. And the library community for example, among others, has challenged OMB's assertion that information-related activities such as library operations are essentially commercial in nature.[26]

OMB Circular A-130 on "Management of Federal Information Resources," on the other hand, asserts that policies contained in A-76 are applicable to information dissemination. The OMB policy is, in general, reliance on the private sector for information dissemination when cost effective and when not an inherently governmental function. Although not explicitly stated, the OMB drafters of A-130 apparently intended to draw a distinction

> . . . between the issues of whether the government should offer an information product or service and how the product or service should be offered. The first question is whether the

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[26] Letter to Honorable David S. Linowes, Chairman, President's Commission on Privatization, from James P. Riley, Executive Director, Federal Library and Information Center Committee, Jan. 29, 1988.

government should undertake an information activity at all, or leave it to the private sector. Answering this question appears to be an inherently governmental function. However, once it has been determined that the government has a proper role, the second question of how to carry out the role arises. Here it is appropriate to inquire whether the activities involved in carrying out the role are commercial, and hence might be accomplished through grant or contract.[27]

There are two problems with current OMB policy. First, there has not been a systematic analysis of what information dissemination functions are inherently governmental. An analysis of NTIS and GPO privatization proposals (see ch. 12) suggests that many NTIS and GPO dissemination functions are not suitable for privatization. Many other agency information dissemination functions arguably are vital to agency performance of statutory missions, and would thereby qualify as governmental. However, whether these functions are inherently governmental and therefore not amenable or suitable for contracting out, as appears to be the case for many NTIS and GPO functions, has not been carefully examined. Second, there have not been credible analyses of whether and under what conditions the contracting out of Federal information dissemination functions is cost-effective. Conducting such analyses is not easy.

Numerous GAO audits of agency contracting out activities have identified serious problems that have the effect of overstating savings to the government.[28] In many instances, it is difficult to develop a fair initial comparison between inhouse and contracted out costs. Secondly, contract costs frequently escalate rapidly after the initial contract award, for a variety of reasons. It is difficult to tell if in fact contracting out ends up being less expensive than retaining the activity inhouse (net savings), but it is clear that projected gross savings often do not fully materialize. Other concerns expressed about contracting out, especially in technology-intensive areas, are the loss of governmental expertise necessary to monitor contracts and set overall direction, and the potential for the government to become dependent on the incumbent contractor.

As a matter of general philosophy, some OMB and information industry officials have argued that while Federal agency electronic dissemination of raw data is acceptable, government dissemination of so-called value-added information products and services is not an appropriate governmental function and should be the province of private industry. In this view, dissemination by the Bureau of the Census of statistical data on magnetic computer tapes would be appropriate, but dissemination of value-added or enhanced information—such as a CD-ROM with the data and search software for retrieving and manipulating this data—would not. The major problem with using value-added as a line of demarcation between governmental and private sector roles is that many Federal agencies have mandates (see Tables 11-1, 11-2, and 11-3) to develop and disseminate what amounts to value-added information and have been doing so for years or decades. Providing value-added information is a well-established and, indeed, a mandated function of government. Restricting the Federal Government from providing value-added information, or from providing such information in electronic form (even if previously available in paper), would appear to substantially diminish the government's role and erode the ability of agencies to carry out numerous statutory responsibilities.

At the same time, however, the concept of multiple levels of value-added may be viable with the private sector frequently providing additional levels of value or enhancement beyond those provided by the government. Federal agencies would continue to provide information as they do today using electronic formats where appropriate and desired by users, and employing private sector contractors where cost-effective and/or necessary to provide the desired quality or timeliness. The private information industry would be able to repackage and resell any Federal information products, and would be able to add further value to create enhanced information products where the market exists, much as the industry does today. The only real difference is that both the governmental and private sector offerings would be moving to a higher and more sophisticated technological level. Congress could address the value-added question in hearings, reports, oversight, and/or legislation.

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[27] Sprehe, "Federal Information," footnote 6, p. 39.

[28] See, for example, U.S. General Accounting Office, *Synopsis of GAO Reports Involving Contracting Out Under OMB Circular A-76*, GAO/PLRD-83-74, May 24, 1983.

In addition, Congress could establish guidelines for the role of private sector contractors in Federal information dissemination. For example, based on experience with agency automation programs to date—particularly those of the SEC and PTO and other agencies cited in the 1986 House Committee on Government Operations report[29]—with respect to agency contracting out of information dissemination activities, at least six basic principles have emerged from the congressional debate. Briefly, these are that agency contracting out of information dissemination activities should:

1. not impede or erode vital governmental functions;
2. maintain or strengthen public access to agency information;
3. be more cost-effective compared to governmental performance;
4. maintain open and competitive procurements for private vendors (e.g., contractors would have no exclusive rights to develop value-added products);
5. preclude monopoly control by contractors over agency information dissemination; and
6. preclude cross subsidies between contractor services and agency operations.

Also, Congress could establish guidelines on the role of Federal agencies in information dissemination and especially electronic dissemination. Again, at least six basic principles have emerged from the congressional debate to date. These are that agency electronic dissemination activities should:

1. strengthen public access to agency information;
2. improve the cost-effectiveness of agency information dissemination;
3. encourage a diversity of mechanisms for agency information dissemination and preclude copyright-like or monopoly controls over Federal information;
4. include information sources, users, and potential contractors in the planning of information dissemination systems, products, and services;
5. limit user fees to no more than the marginal cost of information dissemination, and preclude fees that compromise agency statutory missions; and
6. minimize competition with the private sector and encourage the private sector, so long as public access to agency information is assured and agency statutory mission requirements are met, to provide additional value-added services and products (beyond the value of those offered by the agency).

These or similar principles could be enacted into law as amendments to the Paperwork Reduction Act, the Printing Act, or other appropriate statutes. The urgency for such action is heightened as individual agencies promulgate their own policies and initiate activities that may not be consistent with the above 12 principles.

Also, Congress could clarify the roles and responsibilities of the governmentwide information dissemination institutions and/or mandate a variety of specific improvements in the management of conventional as well as electronic information dissemination. These are discussed later in this chapter and in chapter 12.

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[29] See, for example, U.S. Congress, House, H.R. 2600, "Securities and Exchange Commission Authorization Act of 1987," 100th Congress, 1st sess., June 4, 1987; U.S. Congress, House, Committee on Energy and Commerce, *Securities and Exchange Commission Authorization Act*, Report to accompany H.R. 2600, 100th Congress, 1st sess., Rep. No. 100-296, Sept. 9, 1987; Also see U.S. Congress, Committee on Government Operations, *Electronic Collection and Dissemination*, footnote 22.

CLARIFICATION OF INSTITUTIONAL ROLES AND RESPONSIBILITIES

Another major issue cluster that warrants congressional attention and action involves institutional responsibilities for Federal information dissemination. The focal points for current debate are the GPO (and related functions of the JCP), NTIS, and the proposals for reorganization of the Federal Government's information dissemination institutions and oversight. These are discussed briefly below in turn. (The role of the DLP in electronic information dissemination, mentioned earlier, can also be viewed as an institutional issue. See chs. 6 and 7 of this report for discussion.)

GPO. The Printing Act of 1895 (recodified in 1968 by P.L. 90-620) requires that all Federal printing (with the exception of the Supreme Court) be done by or through GPO, except where the JCP has approved field printing plants or printing procurement by specific agencies. Three specific policy issues have arisen. One is whether the act extends to electronic dissemination or, more broadly, to information dissemination in general, regardless of format. At present, OMB has taken the position that electronic-based information dissemination by executive agencies falls outside of the act's purview. As of August 1988, very few of the electronic dissemination products of the executive agencies are produced by or through GPO or are provided to the GPO Superintendent of Documents for possible inclusion in the sales program. A few agencies participate on a voluntary basis in GPO's magnetic tape sales program, and a few are participating in pilot projects on electronic data transfer and the like. Almost all Federal information products and services in electronic format are produced and disseminated by the individual agencies themselves (or through agency contractors). The JCP has directed (by a 1987 resolution and 1988 letter) that the GPO include electronic formats in the Sales Program and the DLP. However, OMB has taken the position that while executive agencies *may* participate on a voluntary basis in GPO electronic activities, GPO and JCP *may not* require agency participation.

A second GPO institutional issue is whether GPO (and JCP) procurement authority extends to computer-based electronic printing technology, at least with respect to the executive branch. Over the past 10 to 15 years, printing technology has incorporated significant electronic and computer-based components, to the point where page layout and composition are heavily computerized. At GPO, about 70 percent of the input textual material is provided in electronic format. Increasingly, the printing process is becoming a largely electronic one, with material remaining in electronic form from initial keyboarding, through layout, composition, and revision cycles, until a final version is ready for production. The production format can be, and frequently still is, paper, but it can also be microform, magnetic tape, diskette, and other nonpaper formats. Thus, the dividing line between traditional "ink on paper" printing and electronic or computerized printing is no longer clear or, perhaps, even a valid or a feasible distinction.

A GPO procurement for electronic printing on behalf of the U.S. Army (the 600-S program) was terminated in part because of alleged contracting irregularities (that are outside the scope of this study), but, more importantly, because of possible conflict with the Brooks Act that governs executive agency procurement of automatic data processing, computers, and telecommunication-related equipment. GPO took the position that the 600-S procurement, like other GPO printing procurements, was exempted from the requirements of the Brooks Act as provided for in the Legislative Branch Appropriations Act of 1977. The House Committee on Government Operations took the position that the 600-S procurement included a substantial amount of computer-related technology and, thus, should have been procured under the Brooks Act and GSA contracting procedures rather than the Printing Act and GPO contracting procedures. Congress subsequently (in 1986) amended the Brooks Act to cover any agency procurement that included significant ADP or related technology or services. The revised statutory definition of automatic data processing is:

> . . . any equipment or interconnected system or subsystems of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching interchange, transmission, or reception of data or information (1) by a Federal agency or (2) under contract with a Federal agency which (a) requires the use of such equipment or (b) requires the performance of a service or the furnishing of a product which is performed or produced making significant use of such equipment.

The term equipment is defined to include "computers; ancillary equipment; software, firmware, and similar procedures; services, including support services; and related resources as defined by regulations issued by the Administrator for General Services."[30]

GPO acknowledges that comprehensive electronic publishing systems include significant amounts of both printing and computer technologies, and that procurement of these so-called "mixed resource" systems requires close cooperation between GPO and GSA. The Public Printer has called for the development of a GPO-GSA joint procurement program for major electronic publishing systems that would satisfy GPO's obligations under the printing provisions of Title 44 of the U.S. Code and GSA's obligations under the Brooks Act.[31] This may require involvement of the JCP, which has approval authority over GPO procurements, and the House Committee on Government Operations, which has oversight authority over GSA and Brooks Act procurements, and possibly other committees, with respect to major procurements on the scale of 600-S (several hundred million dollars). The much smaller Air Force 50-S electronic publishing procurement ($10 million over 3 years) was awarded by GPO in January 1988 without incident or controversy under existing GPO contracting procedures.

This issue highlights the ambiguity about the applicability of the Printing Act, Brooks Act, and Paperwork Reduction Act to agency electronic information dissemination systems and those systems in particular in which are imbedded conventional printing functions. Since the major thrust of agency automation programs (including automation of information collection and dissemination functions) is towards integrated systems, these statutory ambiguities and conflicting interpretations are likely to be aggravated over time, thus providing even more impetus for further congressional review and, perhaps of necessity, statutory adjustments.

The third GPO institutional issue is whether the statutory basis for GPO (and JCP) control over executive branch printing activities is constitutional. The U.S. Supreme Court's 1983 decision in *INS* v. *Chadha* struck down the legislative veto as unconstitutional.[32] This decision has been interpreted by the U.S. Department of Justice (DOJ) as invalidating provisions of the Printing Act that provide for control over and prior approval of executive branch printing by the JCP.[33] (*INS* v. *Chadha* was also cited as part of the basis for DOJ opposition to JCP proposals for revising the *Government Printing and Binding Regulations* in 1983 and 1984.[34]) Based on this DOJ interpretation, the Federal Acquisition Regulations (FAR) were revised in 1987 and provided that executive agencies need only give the JCP advance notice of agency printing plans—not seek JCP approval. Further, agencies with their own printing plant or printing procurement capability would not be required to obtain their printing from or through GPO.[35] The DOJ interpretation and FAR revisions were disputed by the JCP and GPO.[36] The Public Printer testified that the FAR revisions would:

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[30] U.S. Congress, "Continuing Appropriations Resolution for Fiscal 1987," Title VIII—"Paperwork Reduction Reauthorization," Part B—Amendments to the Brooks Act, Sec. 822(a) Amending Section 111(a) of the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 759(a), p. 357.

[31] Ralph E. Kennickell, Jr., Public Printer of the United States, testimony before the Subcommittee on Legislative Branch Appropriations, Committee on Appropriations, U.S. Senate, "GPO Appropriations Estimates for Fiscal Year 1989", Mar. 10, 1988.

[32] 103 S.Ct. 2764 (1983).

[33] Office of Legal Counsel, U.S. Department of Justice, Memorandum for William H. Taft, IV, Deputy Secretary of Defense, Re: "Effect of *INS V. Chadha* on 44 U.S.C. 501, Public Printing and Documents," Mar. 2, 1984.

[34] Office of Legal Counsel, U.S. Department of Justice, Memorandum for Michael J. Horowitz, Counsel to the OMB Director, Re. "Constitutionality of Proposed Regulations of Joint Committee on Printing Under *Buckley V. Valeo* and *INS V. Chadha*," Apr. 11, 1984, and Re. "Government Printing, Binding, and Distribution Policies and Guidances of the Joint Committee on Printing," Aug. 21, 1984.

- be inconsistent with the legislative intent of Title 44;
- substantially increase the government's printing costs; and
- jeopardize the GPO sales and depository library programs.[37]

While the legal issues remain unresolved, Congress included a provision in the fiscal year 1988 Continuing Appropriations Resolution that mooted the FAR revisions and was intended to maintain the status quo. This provision is also included in the Legislative Branch Appropriation Bill for fiscal year 1989 (H.R. 4587).[38]

NTIS. The major institutional issue concerning NTIS is the Administration's proposal to privatize the agency. In late 1985, the Office of Management and Budget (OMB) asked the Department of Commerce to develop proposals for privatizing NTIS. While OMB did not initiate a formal contracting out procedure, the initial impetus for NTIS privatization can be viewed in part in the context of OMB's Circular A-76, which states that the "Federal Government shall rely on commercially available sources to provide commercial products and services if the product or service can be procured more economically from a commercial source." As noted earlier, A-76 requires detailed cost comparisons and explicit determination of inherently government functions that are not subject to contracting out. Based, in part, on the results of Department of Commerce studies conducted in 1986, OMB decided in 1987 to pursue a substitute contracting out procedure for NTIS known as Fed Co-Op (discussed later), rather than follow the formal A-76 process.

These proposals have become very controversial. The Administration has argued that NTIS provides what is essentially a commercial service performed by the Government and that it should be contracted out or otherwise privatized. The Administration has asserted that privatizing NTIS would maximize reliance on and minimize competition with the private sector, reduce the cost of government, and/or increase the quality and effectiveness of NTIS services. Several private firms have expressed interest in operating NTIS. The academic, research, and scientific communities, however, have argued, in general, that NTIS performs an important and inherently governmental function that is not suitable for privatization, and that no cost savings or service improvements have been demonstrated to occur if NTIS were to be privatized. The Federal scientific and technical agencies, the source of NTIS information, have expressed concerns about the the viability of NTIS if privatized and whether U.S. and foreign government agencies would continue to cooperate with a privatized NTIS.

As an agency of the U.S. Department of Commerce, NTIS operates under the statutory authority of the Secretary to collect, exchange, and disseminate scientific and technical information (Title 15, U.S. Code, Sections 1151-1157). At OMB direction, the Department of Commerce has conducted numerous studies and public meetings over the past 2 years to develop and evaluate proposals for NTIS privatization. A review of all available documents indicates that the cost-effectiveness of privatizing NTIS has not been established, and that the departmental task force studying the matter recommended against privatization on various grounds. A 1986 departmental analysis of the entire range of options concluded that only minor adjustments were warranted, and recommended against privatization on the grounds that it would not be cost-effective and could jeopardize important government functions.[39] Consequently, OMB directed that privatization proceed not via the usual A-76 contracting out procedures, but through the new Federal Employee Direct Corporate Ownership Opportunity Plan (known as Fed Co-Op) procedures issued in early 1987 by the Office of Personnel Management. Under Fed Co-Op, Federal employees are transferred into a private company or organization and receive stock ownership. Opponents argue that the Fed Co-Op approach is circumventing otherwise unattainable A-76 requirements, and is essentially another privatization mechanism with unproven value to the government. Nonetheless, the Department of Commerce issued a request for information in January 1988, held a pre-bidders meeting on January 29, 1988, and proceeded down the Fed Co-Op path.[40] A congressional hearing held February 24, 1988 by the House Committee on Science, Technology, and Space, Subcommittee on Science, Research, and Technology, revealed widespread opposition to the Fed Co-Op privatization plan, including, notably, opposition from the Information Industry Association.[41] Subsequently, the Secretary of Commerce rejected the plan.

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[35] See *Federal Register*, vol. 52, No. 54, Mar. 20, 1987, pp. 9036-9038.

[36] Letter to Terence C. Golden, Administrator, General Services Administration, Caspar W. Weinberger, Secretary of Defense, and James C. Fletcher, NASA Administrator, from Senators Wendell Ford, Ted Stevens, Dennis De Concini, Albert Gore, Jr., and Mark O. Hatfield and Representatives Frank Annunzio, Joseph M. Gaydos, and Leon E. Panetta, June 5, 1987. Also see letter to Rep. Frank Annunzio, Chairman, Joint Committee on Printing, from H. Lawrence Garrett, III, General Counsel, U.S. Department of Defense, June 15, 1987. For general background, see Morton Rosenberg, American Law Division, Congressional Research Service, Memoranda to the Joint Committee on Printing, "Effect of Legislative Veto Decision on the Joint Committee on Printing and Possible Congressional Responses," Apr. 16, 1985, and "Legal Propriety of Amendments to the Federal Acquisition Regulation Respecting the Conduct of Field Printing Operations by Executive Agencies," May 21, 1987.

[37] Kennickell, "Appropriations Estimates," footnote 31.

[38] U.S. Congress, " Continuing Appropriations Resolution for Fiscal 1988," Sec. 309, 100th Congress, 1st sess., p. 324. Also see letter to Rep. Vic Fazio, Chairman, Subcommittee on [the] Legislative Branch, House Committee on Appropriations, from OMB Director James C. Miller, Nov. 16, 1987. Also see U.S. Congress, House, Committee on Appropriations, Legislative Branch Appropriations Bill, 1989, Report No. 100-621, 100th Congress, 2d sess., May 12, 1988.

The controversy over NTIS has precipitated legislative action by the relevant House and Senate authorizing committees to block privatization. Both the House Committee on Science, Space, and Technology and the Senate Committee on Commerce, Science, and Transportation have enacted language prohibiting the contracting out of NTIS, or any major NTIS activities, without explicit statutory approval. This prohibition was included as part of Title V ("Technology Competitiveness") of the comprehensive trade legislation (H.R. 4848) signed into law on August 23, 1988. Other congressional actions included language incorporated by the House Committee on Science, Space, and Technology in the National Bureau of Standards Authorization Act for fiscal year 1989 that would convert NTIS to a government corporation within the Department of Commerce, to be known as the National Technical Information Corporation.[42] The House Committee on Energy and Commerce, on a sequential referral, reported out the NBS Authorization Act with amendments that would prohibit NTIS privatization and would authorize NTIS use of net revenues for capital investment. However, the amendments would retain NTIS as a line agency of the Department of Commerce, not as a government corporation.[43]

Government reorganization. The NTIS controversy has been one more factor contributing to heightened interest in proposals for reorganization of the major Federal information institutions. Such proposals have been considered over the past 8 years. As early as 1979, an advisory group appointed by the JCP considered the possibility of establishing a new central office combining the functions of GPO, NTIS, and OMB with respect to public information policy, in order to facilitate public access and eliminate duplication. A National Publications Act of 1980 was introduced to establish a National Publications Office along with a Commission that would replace the JCP, but the bill was not enacted.[44] In the past two Congresses, legislation was introduced that would combine the information dissemination functions of GPO, NTIS, and the dissemination or sales offices of major agencies into one governmentwide Government Information Office (GIO).[45] The legislation would also establish a Joint Committee on Government Information in Congress. In 1987, the National Academy of Public Administration completed a study that favored an NTIS corporation.[46] Subsequently, legislation was introduced to reorganize NTIS into a government corporation, and now incorporated into the House Science Committee version of the NBS Authorization Act, as noted above.[47] In 1987 hearings on these and other related bills, the Public Printer testified that GPO would be pleased to provide an institutional home for NTIS as an alternative to privatization.[48] And in 1988, the Librarian of Congress suggested that the Library of Congress also could serve as a home for NTIS.[49]

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[39] U.S. Department of Commerce, "Privatization Proposal for the National Technical Information Service," October 1986, transmitted from Assistant Secretary of Administration Kay Bulow to Carol T. Crawford, OMB Associate Director for Economic and Government, letter dated Nov. 13, 1986.

[40] U.S. Department of Commerce, "Request For Information: Privatization of the National Technical Information Service," Jan. 20, 1988.

[41] U.S. Congress, House of Representatives, Committee on Science, Space, and Technology, Subcommittee on Science, Space, and Technology, *National Technical Information Service*, Hearing, 100th Congress, 2d sess., U.S. Government Printing Office, Washington, DC, Feb. 24, 1988.

[42] U.S. Congress, House of Representatives, Committee on Science, Space, and Technology, *National Bureau of Standards Authorization Act for Fiscal Year 1989*, Report 100-673, Part 1, 100th Congress, 2d sess., U.S. Government Printing Office, Washington, DC, June 3, 1988.

[43] U.S. Congress, House of Representatives, Committee on Energy and Commerce, *National Bureau of Standards Authorization Act for Fiscal Year 1987*, Report 100-673, Part 2, 100th Congress, 2d sess., U.S. Government Printing Office, Washington, DC, July 8, 1988.

The legislation introduced specified that the Joint Committee on Government Information would consist of 8 members, 4 from the House and 4 from the Senate, and, would not have legislative authority, but would have the authority to hold hearings, and conduct other nonlegislative functions. The relationships with existing joint and standing committees were not specified. Depending on its jurisdiction, a new joint committee could be designed to essentially supercede and replace the existing JCP, or it could complement the JCP. A new joint committee would be unlikely to supercede the functions of standing legislative committees, unless Congress were to depart from a now well established tradition that joint committees not be assigned legislative authority.

The current JCP consists of 10 members, 5 from the Committee on House Administration and 5 from the Senate Committee on Rules and Administration. A new or reorganized joint committee could draw from a larger number of committees. There are many possible combinations. For example, with a total membership of 10, 2 members could be selected from each of the House Committee on Administration and Senate Committee on Rules and Administration, 2 members could be selected from each of the House Committee on Government Operations and Senate Committee on Governmental Affairs, 1 member could be selected from the House Committee on Science, Space, and Technology and 1 from the Senate Committee on Commerce, Science, and Transportation. There are several other committees with potentially relevant jurisdictions, depending on the scope of the new joint committee's charter, including the House and Senate Committees on the Judiciary and the House Committee on Energy and Commerce.

Other alternatives include establishing Special or Select Committees on Government Information in the House and Senate, and/or strengthening existing subcommittees (such as the House Government Operations Subcommittee on Government Information, Justice, and Agriculture) or establishing new subcommittees (such as within the Senate Committee on Government Affairs).

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[44] U.S. Congress, "National Publications Act of 1980," 96th Congress, 2d sess.

[45] U.S. Congress, H.R. 5412, "Government Information Act of 1986," 99th Congress, 2d sess., Aug. 13, 1986; H.R. 1615, "Government Information Act of 1987," 100th Congress, 1st sess., Mar. 16, 1987. Also see Rep. George E. Brown, Jr., *Congressional Record*, Mar. 16, 1987, E952-955.

[46] National Academy of Public Administration, *An Assessment of Alternative Organizational Structures for the National Technical Information Service*, Washington, DC, Feb. 1987.

[47] U.S. Congress, H.R. 2159, "National Technical Information Act of 1987," 100th Congress, 1st sess., Apr. 23, 1987.

[48] See statement of Ralph E. Kennickell, Jr., Public Printer of the United States, before the Subcommittee on the Legislative Branch, Committee on Appropriations, U.S. Senate, Mar. 10, 1988.

[49] Letter to Honorable Doug Walgren, Chairman, Subcommittee on Science, Research, and Technology, Committee on Science, Space, and Technology, U.S. House of Representatives, from Honorable James H. Billington, Librarian of Congress, Apr. 12, 1988.

The primary rationale for a new joint committee would be that government information issues:

- are becoming (or already are) priority national issues in their own right;
- cut across the jurisdictions of several legislative committees;
- reflect the merging of information technologies along one continuum (from collection and processing to storage and dissemination in a variety of printed and electronic formats); and
- need a broad, cross-cutting forum and focal point in Congress.

As in any congressional reorganization, the actual jurisdiction and scope of a new joint committee (or special or select committees) would need to be agreed upon by the various existing affected committees and, of course, by the House and Senate leadership. Achieving such a consensus has proven to be a formidable task in prior congressional reorganizations but has been accomplished.

Other alternatives include: limiting the scope of a new joint committee to "government information dissemination," or possibly revision of relevant provisions of Title 44. The JCP's statutory responsibilities could be revised to more accurately reflect the broader concept of government information dissemination in contrast to the typically narrowly understood concept of printing.

IMPROVEMENTS IN INFORMATION DISSEMINATION MANAGEMENT

OTA has identified several alternatives which could improve the management of Federal information dissemination, irrespective of other policy or institutional actions. These management improvements could be implemented by executive action using existing statutory authority with the concurrence of Congress, but with no required statutory action. One or any combination of these alternatives could be incorporated into a legislative package, as amendments to various statutes, should Congress determine that a stronger mandate is necessary.

Electronic Publishing/Dissemination Technical Standards

As discussed in chapters 2, 3, and 4, the government is increasingly adopting electronic publishing technologies and systems and a variety of electronic dissemination formats. **There is consensus in and out of government that appropriate technical standards are essential if the government wishes to realize potential cost-effectiveness and productivity improvements.** Technical standards could facilitate electronic connectivity between the various agency systems and those of the central information dissemination agencies (such as NTIS and GPO), and flexibility among different formats (so that the same electronic text or database can be outputted in a variety of formats—paper, microform, and/or electronic as appropriate). Electronic publishing can also serve to connect office automation systems, publishing systems, database systems, records management or document storage systems, and the like. Since the initial keyboarding or inputting of material can be the most expensive step in the process, capturing this input for purposes of later processing, revisions, composition, and reproduction is very important.

Standards developed through the widely accepted governmental-private industry cooperative standards-setting mechanisms should be adequate, but the process may need to be accelerated. Key standards-setting areas include:

- optical disks,
- text markup and page/document description languages, and
- electronic data interchange, including the open systems interconnection concept as discussed in chapter 3.

It is important that the lead government agencies coordinate closely on standards-setting activities. These agencies include the National Bureau of Standards (NBS) for the civilian executive branch units, a designated DoD unit (that can integrate and represent the activities of numerous DoD components), and a designated representative(s) of the legislative branch. With respect to text markup and page/document description standards, and perhaps other areas, GPO should be centrally involved.

All major text markup languages (including Standard Generalized Markup Language and the GPO's Full Text Database language) and hybrids thereof should be considered in developing an agreed upon Federal Government standard. This standard (along with others agreed to) could be issued concurrently by NBS as a Federal Information Processing Standard (FIPS), by DoD as a Milspec standard, and possibly by GPO (and the JCP) as an amendment to Federal printing and binding regulations.

Congress may need to accelerate the standard-setting process and/or assign responsibilities, although the standards setting itself would presumably be delegated to the technical specialists. (See chs. 3 and 4 for related discussion.)

Governmentwide Information Index

There is also consensus in and out of government for the establishment of a governmentwide index to major Federal information products—regardless of format. Scholars, researchers, and librarians have for years pointed out the need for improved indexing of Federal information. The results of the GAO surveys summarized earlier indicate strong support for an index among the depository libraries, other libraries, scientific and technical associations, and general associations surveyed. Also, OTA meetings with Federal agency officials identified considerable support for an index, although some agency officials were concerned that an index might be used to thwart rather than enhance agency information dissemination and/or that a governmentwide index might unnecessarily duplicate agency indices. Information industry representatives participating in the OTA study supported the concept of improved indexing of government information, but some were concerned that an index developed by the government could discourage private sector indexing initiatives and might result in a more costly, lower quality product.

At present, GPO prepares an index to official Federal publications, primarily printed reports, pamphlets, and periodicals. NTIS prepares an index to the so-called "gray" literature, that is, scientific and technical reports and papers prepared by government staff and contractors. These materials are primarily in paper (or microfiche) format, and generally have very limited demand. There is a small amount of overlap between the GPO and NTIS indices. Some individual agencies prepare indices to their own information products and services, including all of the major information dissemination mission agencies (such as the Bureau of the Census, Bureau of Labor Statistics [BLS], DOE's Energy Information Administration [EIA], Bureau of Justice Statistics [BJS], and U.S. Geological Survey [USGS]). Coverage of electronic formats is irregular and incomplete. GAO at one time prepared an index to Federal information products and services, but this effort has been terminated. There is no complete index. NTIS indexes some electronic products. Several private vendors have prepared directories to Federal databases and/or various categories of Federal information. The agency response to OMB Bulletin 87-14 could lead to the development of improved agency indices and provide the basis for an integrated governmentwide index.

While there is support for an index, there are differences of opinion on how and by whom the index should be implemented. Respondents to the GAO surveys were not asked to specify whether an index should be provided by the government, commercial vendors, or not-for-profit organizations. One possible alternative would be for either GPO or NTIS to consolidate the various agency indices into one integrated index. The index could then be produced in a variety of formats—ranging from paper and microfiche to optical disk and online.

Should Congress conclude that an index is warranted and should be provided by the government, Congress may need to assign responsibility for developing the index and require that a detailed implementation plan be prepared. The plan would need to consider: the different bibliographic and indexing methods currently employed by NTIS, GPO, and other Federal agencies; the cumulative experience of the library and information science communities with respect to indexing; and the successes and failures of prior governmental and private sector indexing initiatives.

Since the index information would not be copyrightable, private sector vendors would be able to add value to, repackage, and/or resell the information on the commercial market. As noted earlier, OMB Bulletin 87-14 directs agencies to establish and maintain an electronic index (or inventory) of all their information dissemination products and services, and to make the index available to the public directly or through another Federal agency or the private sector. The bulletin directs agencies not to offer information services already available from the private sector (or other agencies). It is unclear whether this restriction is intended to apply to the indices themselves. Also, the bulletin does not address whether and how the agency indices should be consolidated into a governmentwide index and/or maintained in a centrally-accessible location. Congress may need to define the government's interest and establish how, if at all, any pre-existing privately developed indices would need to be accommodated.

Government Information Dissemination Innovation Centers/Committees

Federal agency officials expressed strong support for much improved mechanisms to exchange learning and experience about technological innovations. Federal agencies are involved in a very wide range of research, development, and operations activities with respect to information dissemination. To this end 114 civilian departmental agency components reported having conducted studies as indicated in Table 11-5.

There appears to be a substantial knowledge base within the civilian sector of government, and this is paralleled by a similar or, if anything, greater level of knowledge-generating activity in the defense sector.

Table 11-5.—Federal Civilian Agency Research or Evaluation Studies

Technology	Percent of agencies that conducted a research or evaluation study
Electronic Collection/filing	
Electronic data transfer (computer to computer)	54.4
Floppy disk	52.6
Electronic mail	48.2
Magnetic tape/disk	45.6
Computerized telephone calls	16.7
Non-paper Storage	
Floppy disk	51.8
Magnetic tape/disk	45.6
Micrographics (microfilm/microfiche)	41.2
CD-ROM	21.9
Optical disk (WORM)	18.4
Videodisk	14.0
CD/I	7.9
Optical disk (erasable)	4.4
Printing	
Laser and other non-impact printing	54.4
Computer graphics	52.6
Desktop publishing systems	46.5
Computer-aided page make-up	43.0
Electronic publishing systems	30.7
Electronic photocomposition	28.9
Photo-offset printing	24.6
Microform printing	16.7
Electronic dissemination	
Floppy disk	48.2
Electronic data transfer (computer to computer)	47.4
Electronic mail	44.7
Electronic bulletin board	42.1
Magnetic tape/disk	42.1
Teleconferencing	24.6
Videotape	23.7
CD-ROM	17.5
Expert systems	14.9
Film	13.2
Videoconferencing	13.2
Videodisk	10.5
Digital cartographic systems	7.9
Selective dissemination of information systems	7.0
Broadcast television	7.0
CD/I	5.3
Videotext/teletext	4.4
One-way cable television	4.4
Interactive cable television	2.6

SOURCE: GAO Survey of Federal Agencies, 1987.

However, Federal officials at all levels, from technical specialists to program managers to senior policymakers, in both the civilian and defense sectors, agree that current mechanisms for the sharing and synthesis of this knowledge are very seriously deficient. This view is corroborated by OTA staff and contractor research. Typically, knowledge is not shared effectively even within a single agency component, let alone between several agency components within a single department or between departments.

There are some noteworthy efforts to address part of this problem, such as by the Federal Publishers Committee, and the Special Interest Group on CD-ROM Applications and Technology (SIGCAT), both of which are quasi-official interagency groups. Other examples are CENDI (*C*ommerce, *E*nergy, *N*ASA, *D*efense *I*nformation), an interagency group of Federal science and technology agencies concerned with scientific and technical information dissemination, and the Depository Library Council, an advisory group to the Public Printer that has devoted attention to electronic dissemination pilot projects. Also, several agencies have recently established laboratories for the testing, evaluation, and demonstration of new technologies. These include the CD-ROM and Electronic Publishing Laboratories at NBS, and the Artificial Intelligence, Video Laser Disk, High Density Information Storage, and Defense Information Gateway Laboratories operated as an activity of the Defense Technical Information Center. GPO has established a prototype dial-up microcomputer-based electronic publishing and training program. Also, the Public Printer has proposed that GPO establish a Federal Publishing Institute to provide a cohesive training program for Federal printing and publishing officials. And there are a variety of relevant training programs and courses offered in support of agency IRM activities.

As commendable as these activities are, further efforts seem necessary. Congress may wish to consider legislating or directing the establishment of information dissemination innovation centers in each branch of government. These could be located at DTIC (for the defense sector), NTIS and NBS (for the civilian executive branch), GPO (for the legislative branch), and possibly, the Federal Judicial Center (for the judicial branch). These major centers could be complemented by agency innovation centers, perhaps operated as part of a strengthened and revised agency IRM program (see later discussion), and possibly by an academic research center funded to provide outside input to agency innovation. Also, Congress may wish to consider establishing or otherwise directing the formation of an interagency information dissemination task force or coordinating committee with a primary task of encouraging innovation and exchange of knowledge gained from studies, pilot projects, and operational experience. (For examples of pilot projects, see chs. 2, 3, 4, 5, 7, and 8.)

Finally, Congress may wish to encourage or require agencies to conduct planning studies, similar to that conducted by DTIC, to creatively explore and develop their own visions of future information dissemination activities. In 1984, DTIC completed its *DTIC 2000* study and concluded that by the year 2000:[50]

> DTIC will be a highly automated operation where the vast majority of data transfers are electronic. It will be situated in an environment where all users have access to computer work stations; where computer storage has the density, access speeds, and reliability to permit full-text storage of all items; . . . where mailing of paper products has been replaced by electronic transmissions; [and] where the power/speed of computers and the sophistication of software eliminate the need for both manual indexing and development of intricate search strategies.

Today DTIC is already beginning to implement this vision. Although few Federal agencies have conducted a formal "Agency 2000" study, many are experimenting with electronic information dissemination. And variations on the year 2000 scenario projected by DTIC could be helpful to many other agencies in planning their information future.

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[50] U.S. Department of Defense, Defense Logistics Agency, Defense Technical Information Center, DTIC 2000: A Corporate Plan for the Future, DTIC/TR-84/3, July 1984.

Revised Information Resources and Personnel Management

The Information Resources Management (IRM) concept, as originally conceived and debated in the 1970s, was intended to include all phases of the information life cycle—collection, processing, analysis, storage, and dissemination. The Paperwork Reduction Act of 1980 essentially enacted the IRM concept, but the original statutory language was vague as to coverage of information dissemination. 1986 amendments to the act removed most of the ambiguity by including "information dissemination" in the statutory language. However, numerous Federal officials have observed that information dissemination is still not an effective part of many agency IRM programs or, if information dissemination is included, it is not well understood by many senior IRM officials. These observations have been confirmed by OTA staff and contractor research, and by studies by nongovernmental groups.

For example, a 1987 National Academy of Public Administration study titled *Federal Information Resources Management: Bridging Vision and Action* found that roughly half of agency IRM offices surveyed did not include responsibility for library services, printing, or reproduction. Of the 16 departmental IRM offices surveyed, only 8 covered library services and 9 covered printing and reproduction, while 15 of 16 covered paperwork reduction and 14 of 16 covered computer operations and data telecommunications. Eleven of 16 covered voice telecommunications and record management.

Two situations appear to warrant congressional attention. The first concerns senior IRM officials, typically with ADP, computer, and/or management information system backgrounds, who are viewed as frequently failing to understand or appreciate their agency's information dissemination functions, including library, printing, publishing, and public information activities, among others. These, in many cases, appear to be the less understood or supported members of the IRM family. Congress may wish to encourage or direct agency actions to remedy this problem. Possible actions include:

- requiring that either the senior agency IRM official or his/her deputy have information dissemination training and experience;
- establishing or designating continuing education programs for senior IRM staff to learn more about information dissemination;
- strengthening the role of already existing cross-cutting groups such as the Federal Publishers Committee, the Federal Library and Information Center Committee, and the Interagency Advisory Council on Printing and Publishing Services;
- involving senior IRM officials directly in agency or innovation centers and interagency task force that may be established; and
- establishing new or revised job definitions and career tracks for information dissemination professionals working in the government.

Developing career tracks for information dissemination professionals could be particularly important, since new technological applications are changing the nature of many printing, publishing, writing, public information, library, and related jobs. However, there is little focused effort or agreement on how these job definitions should be revised. There is growing attention to the need to reclassify computer-related positions and to develop appropriate training and career advancement opportunities (as evidenced by Office of Personnel Management course offerings on this subject). However, the focus to date has been on traditional automated data processing positions and not on information dissemination positions.

There are no definitive estimates of the number of Federal employees involved with information dissemination. However, if the definition is applied broadly to include some portion of writers, editors, librarians, printers, public affairs personnel, computer and communication operators, and the like, the total would appear to be in the tens of thousands of employees. The number of total Federal employees in relevant job categories is shown in Table 11-6, along with OTA's estimate of the percentage directly involved with information dissemination. Based on the assumed percentages of each job category involved with information dissemination (100 percent of printing, public affairs, and librarians; 50 percent of audio-visual, writing, editing, and archiving; 10 percent of computer and communications), about 30,000 Federal employees are included. This is about 30 percent of the total employees for the job categories listed, and undoubtedly understates the actual number since significant, but unknown, numbers of engineers, technicians, analysts, statisticians, and administrators in other job categories are involved with information dissemination.

The Office of Personnel Management (OPM), the General Services Administration, and GPO could be assigned responsibility to review all Federal job categories potentially relevant to information dissemination, assess the need for reclassification, redefine the jobs as needed, and establish necessary training and career development programs. To be most effective, these activities would be carried out with full participation of employees and employee organizations, including relevant labor unions.

Involvement of GPO labor unions would be particularly important for printing and related occupations. GPO is the third largest Federal blue-collar employer in the Washington, D.C. area, as shown in Table 11-7. Also, GPO has

Table 11-7.—Top 10 Federal Blue-Collar Employers in Washington, DC Metropolitan Statistical Area, Fiscal Year 1985

Employer	Number of employees
Department of the Navy	3,647
Department of the Army	3,257
Government Printing Office	2,942
General Services Administration	2,752
Department of Health & Human Services	2,178
Department of the Treasury	1,891
Architect of the Capitol	1,634
Department of the Air Force	1,157
Department of the Interior	979
Smithsonian Institution	967

SOURCE: Office of Personnel Management, 1988.

Table 11-6.—Federal Employees in Job Categories Relevant to Information Dissemination, Fiscal Year 1985

Job category	Total employees	Employees involved with information dissemination	
		Percent	Number
Computer operation	10,256	10	1,026
Computer specialist	40,122	10	4,012
Computer clerk & assistant	10,291	10	1,029
Printing	4,617	100	6,617
Printing management	1,490	100	1,490
Printing clerical	311	100	311
Communications management	1,933	10	193
General communications	3,287	10	329
Communications specialists	2,950	10	295
Communications clerical	636	10	64
Public affairs	3,286	100	3,286
Audio-visual production	984	50	492
Writing and editing	2,138	50	1,069
Technical writing and editing	1,789	50	895
Editorial assistance	2,358	50	1,179
Librarian	3,507	100	3,507
Library technician	3,619	100	3,619
Technical information services	1,530	100	1,530
Archivist	403	50	202
Archivist technician	1,024	50	512
Totals	98,531		31,627

SOURCE: Office of Personnel Management and Office of Technology Assessment, 1988.

the largest number of printing positions of all Federal agencies, as indicated in Table 11-8. These figures include printing occupations and not supporting occupations such as carpentry, maintenance, mechanic, and industrial equipment operator. (For further discussion of the GPO labor force, see ch. 4.)

A second situation meriting congressional consideration is management information, especially budget and contracting data, about information dissemination activities. Annual as well as 5-year agency and governmentwide information technology plans generally do not break out expenditures for information dissemination. The agency responses to OMB Bulletin 87-14 may help in this regard, since OMB asked for agency expenditure data for all dissemination products and services, including electronic formats. However, the responses are not yet available. If this process does not work, Congress may wish to establish a reporting requirement. Also, the OMB bulletin may have excluded significant DoD activities. For example, DoD officials estimate that, of the $85-$100 billion total annual weapons systems procurement, 5 to 10 percent is spent on technical information (i.e., the creation, maintenance, updating, and dissemination of technical documentation for design, maintenance, and operation of weapon systems). This translates into an annual expenditure of $4-$10 billion for technical information just within the weapons procurement accounts. The problem is that there is no separate reporting of contractual costs for technical information and information systems. Therefore, DoD officials are at a severe disadvantage in managing technical information and information systems procurement, monitoring contractual performance, negotiating contract modifications and follow-ons, and evaluating actual capabilities against planned or projected performance. Even though DoD officials recognize the need for improved reporting, management of the DoD bureaucracy is so difficult that congressional action may be needed.

Table 11-8.—Top 10 Federal Agencies With Largest Printing Workforce, Fiscal Year 1985

Agency	Number of employees
Government Printing Office[a]	1,783
Department of the Army	1,042
Department of the Navy	920
Department of the Treasury[b]	527
Department of the Air Force	496
Other Defense Agencies	474
General Services Administration	189
Department of Commerce	164
Department of Agriculture	137
Department of the Interior	113

[a] Includes only direct printing occupations such as composing, platemaking, letterpress, offset press, and bindery, and not general support, technical, and management occupations.

[b] Primarily the Bureau of Printing and Engraving.

SOURCE: Office of Personnel Management, 1988.

For changes in information resource and personnel management to be successful, a clear understanding by senior agency officials that the new information dissemination technologies can, and probably will, significantly change organizational structures, job definitions, and administrative procedures is necessary. The successful senior official will likely have a good strategic sense of where the agency is or should be headed, and will define and implement the necessary training, career development, and managerial reporting techniques needed to move the agency in the desired direction.

Finally, to the extent that agency press and public information activities are included with the IRM umbrella, then IRM provides a possible focal point for electronic dissemination of press releases and other perishable information. Federal agency public information officials and members of the press interviewed by OTA generally supported the concept of electronic press releases, although not as a total substitute for the paper format. Several agencies already provide electronic press releases directly to the press and/or via private electronic news and wire services. The major question seems to be not whether but how the electronic press releases should be provided. Of particular concern are the relative advantages of various electronic formats and the equity implications of alternative delivery and pricing mechanisms. For example, while small, out-of-town newspapers could be major beneficiaries of electronic releases, since mailed press releases arrive several days late, these small newspapers may be the least able to pay for electronic services. This suggests the possible need for consideration of action to minimize economic barriers to access. (For further discussion, see ch. 10.)

IMPROVEMENTS IN CONVENTIONAL PRINTING

Despite the rapid increase in use of and demand for electronic formats, the results of the GAO surveys and various other studies (see chs. 2, 3, and 4) indicate that paper is likely to remain the format of choice for many purposes because of convenience and portability. There is likely to be significant demand for conventional ink-on-paper printed copies of a broad range of Federal reports and other printed materials. Even with advances in electronic publishing (as outlined in chs. 3 and 4), many of these will require conventional ink-on-paper printing. As a consequence, for at least the next 5 years and probably longer, there will be a need to continually improve the Federal Government's conventional printing capabilities, currently carried out largely by or through GPO, except as specifically exempted by law or by the JCP or GPO.

In obtaining printing from or through GPO, Federal agencies seek competitive costs, quick turnaround, and high quality; the agencies also desire accurate and timely cost estimates and billing information. These three aspects of GPO's conventional printing work are discussed below, along with identification of possible alternatives for improvement.

Cost

With respect to cost, some Federal agencies have asserted that they could obtain printing more cheaply by procuring directly from the private sector rather than from or through GPO. To evaluate this assertion, OTA asked GPO to prepare cost estimates for 20 sample printing jobs printed at the GPO central plant, the GPO regional plants, and procured from the private printing industry by the GPO printing procurement office. OTA also asked three of the major agency printing plants (at the Departments of the Army, Commerce, and Energy) to prepare cost estimates on the same 20 printing jobs. Finally, OTA asked several private printing companies to prepare cost estimates on the same 20 printing jobs. The 20 sample jobs are described in Table 11-9, followed by cost estimates in Tables 11-10 and 11-11.

The results indicate that GPO-procured printing is substantially less expensive than either GPO inplant or agency inhouse printing for these sample jobs. GPO central plant printing is generally more expensive than GPO regional inplant printing; and agency inplant printing is generally, but not always, more expensive than GPO inplant (central or regional) printing. Several caveats are in order here. These results hold for the sample jobs only. Many of these jobs would not normally be done at agency plants and the conclusion cannot be drawn that current agency work is necessarily more expensive than it need be. For example, for short reports and press runs, the Army's printing plant is less expensive than the GPO main plant, but still more expensive than GPO-procured costs. Also, costs vary widely depending on the match between specific jobs and specific printing facilities and on the allocation of indirect and overhead expenses to printing costs. Only gross generalizations are possible based on these data.

The results also suggest that GPO-procured printing is less expensive than or at least competitive with printing obtained by individual agencies directly from private printers. The cost comparison suggests that private printing is rarely less expensive than GPO procured, typically more expensive than GPO-procured but less expensive than main plant inhouse printing, and occasionally even more expensive than GPO inhouse printing. Again, several caveats apply. These results hold for the

Table 11-9.—Description of 20 Sample Printing Jobs Used for Estimating Costs[a]

Job Number	Number of pages	Number of copies	Quality level[b]	Turnaround time[c] (weeks)	Trim size (inches)	Binding
1	30	11,200	4	4	8½×11	Drill and band
2	44	32,018	4	4	8½×11	Drill and side stitch
3	220	500	3	2	8¼×10¾	Drill
4	142	3,500	3	2	8½×11	Perfect
5	36	65,000	3	2	8½×11	Saddle stitch
6	8	30,257	4	3	8½×11	Drill and side stitch
7	32	10,000	3	6	8½×11	Perforate and saddle stitch
8	16	1,201	4	4	8½×11	Shrink wrap and saddle stitch
9	24	2,919	3	1	8½×11	Drill and saddle stitch
10	40	2,200	3	2	5⅞×4¼	Side stitch
11	108	1,300	4	4	8¼×10¾	Drill and saddle stitch
12	454	1,800	3	2	7⅞×10¼	Drill and perfect
13	36	102,619	4	4	4×5¼	Saddle stitch
14	46	2,834	4	1	8½×11	Saddle stitch
15	122	400	4	4	6×9	Perfect
16	52	4,905	4	2	7⅞×10¼	Saddle stitch
17	196	17,985	3	3	6×9	Perfect
18	20	175,019	3	3	8½×11	Saddle stitch
19	320	1,139	4	4	8½×11	Drill and side stitch
20	304	1,000	4	4	7⅞×10¼	Drill and side stitch

[a] Ink Color black for all jobs; text stock 50 lb. white offset for all jobs except numbers 4, 8, 9 which are 60 lb. white offset and numbers 17 and 18 which are 70 lb. white matte coated. Cover stock varies but was specified.

[b] Quality levels per GPO standards.

[c] No surcharges.

SOURCE: U.S. Government Printing Office, 1988.

Table 11-10.—Cost Estimates for 20 Sample Printing Jobs, in Dollars, GPO Regional and Main Plants

	GPO main plant[a]			GPO regional plant[b]	
Job number	Procured	In plant	In plant special rate	Procured	In plant
1	$ 3,020	$12,046	$ 4,291	$ 2,503	$ 9,800
2	4,361	17,745	7,492	5,107	12,400
3	872	5,785	1,732	960	3,500
4	2,239	7,515	3,152	2,698	—
5	11,375	21,005	15,854	12,114	14,500
6	759	5,880	1,736	893	2,400
7	1,017	3,192	3,026	1,179	2,520
8	241	954	351	270	645
9	569	1,971	862	633	1,260
10	448	1,816	690	472	1,515
11	949	3,466	1,401	1,128	2,800
12	3,868	12,046	6,550	4,630	—
13	13,597	14,299	14,299	18,271	18,500
14	744	3,128	1,152	769	2,100
15	764	3,014	1,109	741	—
16	1,336	2,976	1,879	1,406	2,885
17	24,248	27,100	27,100	19,411	—
18	25,585	53,248	45,342	24,004	—
19	2,301	9,676	4,488	2,542	2,765
20	1,724	6,419	2,375	1,838	5,800

[a] Main plant procured estimates based on general usage contracts using the average price of the lowest 5 bidders; in-plant estimates based on GPO price scale as of Dec. 1, 1987; in-plant special rate is equal to the 10th lowest bid plus 10%.

[b] Estimates are for Chicago regional plant, calculated on the same basis as for the main plant.

SOURCE: U.S. Government Printing Office, 1988.

Table 11-11.—Cost Estimates for 20 Sample Printing Jobs, in Dollars, Agency Plants and Private Printers

	Agency plants			Private printers direct bid			
Job number	Army	Commerce	Energy	1	2	3	4
1	$ 5,140	$16,403	$ —	$ 7,835	$ 8,256	$ 3,757	$ 3,700
2	21,555	19,647	—	2,242	14,641	5,823	12,125
3	1,683	10,154	2,339	3,098	4,880	1,454	6,265
4	7,604	11,770	6,414	7,027	5,731	2,711	16,100
5	35,802	46,133	—	20,054	17,451	13,114	3,100
6	3,703	3,532	—	7,270	4,600	1,004	2,050
7	4,896	5,794	—	2,497	2,385	1,434	—
8	294	1,846	681	898	833	239	—
9	1,072	1,898	1,743	2,148	1,471	567	—
10	673	1,289	1,078	2,169	1,489	530	—
11	2,148	3,962	2,221	4,897	2,188	1,149	—
12	12,503	18,876	9,209	11,920	10,195	4,981	—
13	28,261	38,525	—	17,977	9,485	17,867	—
14	1,995	3,192	2,474	3,248	2,093	933	—
15	747	2,699	1,446	1,908	2,034	585	—
16	3,902	5,443	3,571	3,890	2,674	1,515	—
17	53,873	87,291	—	27,096	24,000	24,624	—
18	53,556	80,545	—	44,348	33,785	37,514	—
19	5,577	10,158	4,553	10,834	—	2,938	—
20	4,651	8,264	4,120	8,412	—	2,307	—

SOURCE: Departments of the Army, Commerce, and Energy; private printers, 1988.

sample jobs only, and since independent estimates were obtained from only four private printing firms, the results while appearing reasonable, may not be representative. Also, as with GPO and agency inplant printing, private printing costs vary widely depending on the equipment, workload, specialty jobs, and the like. The GPO special rate (discussed in ch. 4) for main plant inhouse printing appears to approximate roughly the cost agencies might pay if obtaining bids directly from private vendors. The special rate is considerably less than the full inhouse cost, but considerably more than the GPO procured cost.

Thus as shown in Table 11-12 the total estimated cost of the 20 sample jobs ranges from a high of $213,281 for GPO main plant inplant printing to a low of $100,017 for GPO main plant procured printing. The cost of GPO regional plant procured printing was almost identical, at $101,569. The costs for private printers No. 1 and No. 3 (the only 2 that bid on all 20 jobs) along with the cost for GPO special rate printing fall in the middle.

To further evaluate the cost of GPO procured printing, the GPO cost—which GPO estimated by using the average price of the lowest five bidders for each job—was compared with both the average and lowest price per job of the private printers submitting bids directly to OTA. The results indicate that the total GPO main plant procured cost of $100,107 is considerably less than the total average private printer cost of $158,440, and is very competitive with the lowest private printer cost of $98,658. And the latter figure may be unrealistically low since it is based on the low bid for every job,

Table 11-12.—Estimated Total Costs for 20 Sample Printing Jobs, in Dollars

Source of printing	Cost of printing[a]
GPO main plant inhouse regular rate	$213,281
GPO main plant inhouse special rate	144,881
GPO main plant procured	100,017
GPO regional plant procured	101,569
Private printer No. 1	189,768
Private printer No. 3	125,046

[a] For 20 sample jobs specified in Table 11-9.

SOURCE: U.S. Government Printing Office and private printers, 1988.

whereas the GPO estimate is based on an average of the lowest five bids, a better approximation of reality, according to GPO. The detailed comparisons are shown in Table 11-13.

In addition, the results of a recent Department of Commerce study indicated that establishing a printing procurement capability at the Bureau of the Census would not be cost-effective compared to using GPO procurement.[51] GPO charges cost plus six percent for procured printing. The Commerce study indicated that the costs of establishing and maintaining a printing procurement capability and the likely diseconomies of scale would far exceed the GPO six percent service charge. Britain's governmental printing office (Her Majesty's Stationery Office) found that centralized printing procurement reduced costs (by roughly 15 to 30 percent) through economies of scale and more competitive bidding.[52] Also, OTA's independent printing consultant concluded that dispersing GPO's printing procurement operation among numerous Federal agencies or separating the procurement function from the GPO main plant printing function would:

- result in diseconomies of scale,
- increase overall procurement personnel staffing and cost, and/or
- reduce familiarity of printing procurement personnel with the state-of-the-art and operational realities of printing.

Table 11-13.—Estimated Costs by Job and Total for 20 Sample Printing Jobs, in Dollars, GPO Main Plant Procured and Private Printer

Job number[a]	GPO Main Plant procured[b]	Private printer average bid[c]	Private printer low bid[d]
1	$ 3,020	$ 5,887	$ 3,700
2	4,361	8,708	2,242
3	872	3,924	1,454
4	2,239	7,892	2,711
5	11,375	13,430	3,100
6	759	3,731	1,004
7	1,017	2,105	1,434
8	241	657	239
9	569	1,395	567
10	448	1,396	530
11	949	2,745	1,149
12	3,868	9,032	4,981
13	13,597	15,110	9,485
14	744	2,091	933
15	764	1,509	585
16	1,336	2,793	1,515
17	24,248	25,240	24,000
18	25,585	38,549	33,785
19	2,301	6,886	2,938
20	1,724	5,360	2,307
Totals	$100,017	$158,440	$98,659

[a] For 20 sample jobs specified in Table 11-9.
[b] Based on average price of 5 lowest bids submitted to GPO.
[c] Based on average price of private printers submitting bids to OTA.
[d] Based on low bid selected from among private printers submitting bids to OTA.

SOURCE: U.S. Government Printing Office, Private printers, and Office of Technology Assessment, 1988.

GPO obtains competitive bids for procured printing in part because of the large number of potential bidders (roughly 15,000 eligible), a smaller but still significant number of active bidders (3,809 active contractors during the 12 months ending March 31, 1988, of which 936 were used by the main plant procurement office), and the large percentage of smaller firms (about 85 percent of all GPO printing contractors). Larger, more expensive firms tend to minimize printing for the government, which is understandable given that the Federal Government accounts for only about one percent of the total U.S. printing market, and many private clients (especially corporate clients) will pay premium prices for printing. GPO uses a computerized system to select potential bidders, and is testing an online bid information service whereby potential contractors can check pending solicitations via an electronic bulletin board.

In sum, based on information available to OTA, the cost of GPO's procured printing appears to be competitive, and there appears to be no financial basis for dismantling the GPO printing procurement program. However, there is a basis for agency concern about the cost of GPO main plant inhouse work. This work is more expensive than procured work, based on the cost comparisons presented above, and at least some agencies prefer not to pay the extra cost. For example, both the Air Force and the Navy indicated that they were "very dissatisfied" with the cost of GPO printing. As excerpted from the GAO survey responses, the Air Force said that "GPO's inhouse costs greatly exceed commercial contractor prices for the same service." The Navy said that "GPO's inhouse prices are much too high compared to the Navy Publications and Printing Service inhouse and commercial contractors."

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[51] U.S. Department of Commerce, Assistant Secretary for Administration, *Printing and Disseminating Census Bureau Publications*, April 1987.

[52] Alex Smith, "The Latest Developments in Print Procurement," *Government Printers' Conference 1984*, Conference Report, September 1984, pp. 9-11.

GPO's Audit Group conducted a survey of agency customers in 1983 and found that, as shown in Table 11-14, the majority of respondents felt that GPO inhouse work was more expensive than GPO contractor work. This survey has not been updated since 1983, and it should also be noted that, while overall agencies preferred GPO contractors on cost (and timeliness), they preferred GPO inhouse work over contractors with regard to quality and responsiveness (solving problems). These survey results are highlighted in Table 11-15. The 1983 GPO survey results suggest greater concern about GPO inhouse costs than the 1987 GAO survey (with about 14 percent of respondents indicating dissatisfaction with cost) but about the same level of concern as the 1987 Federal Publishers Committee (FPC) survey (with about 40 percent of respondents indicating cost as a continuing problem).

As discussed in chapter 2, all of these surveys are subjective and qualitative, and the results have not been validated. But the cost comparisons presented earlier provide independent documentation of the higher GPO inhouse costs, and could by themselves—irrespective of survey results—be considered as sufficient justification for cost-reduction initiatives.

Table 11-14.—Agency Views on Cost of GPO Work, 1983 Survey of Agency Customers

Question: Do you feel that a job will be more expensive if done within GPO or by a GPO procured contractor?

Answer	Percent of respondents
GPO	57.6
GPO contractor	8.8
No difference	9.6
Undecided	18.4
No response	5.0

SOURCE: U.S. Government Printing Office, 1983.

Table 11-15.—Agency Views on GPO Inhouse v. GPO Contractors, 1983 Survey

Question: For the most part, who would you prefer to produce your printing jobs?

Answers	Percent of respondents
GPO	18.4
GPO contractor	49.6
No preference	28.0
No response	4.0

Why would you prefer one over the other?

	Prefer GPO[a]	Prefer contractor[b]
Quality	56.5	32.3
Timeliness	47.8	72.6
Cost	39.1	74.2
Easier to have problems rectified	69.6	22.6
Other	4.3	1.6
No response	4.3	3.2

[a] Based on 23 responses.
[b] Based on 62 responses.

SOURCE: U.S. Government Printing Office, 1983.

There are several alternatives for reducing the cost to the agencies of GPO inhouse work:

- continue to use the special rate mentioned earlier that roughly splits the difference between full inhouse costs and contracted costs and covers GPO marginal costs plus some contribution to overhead;
- reduce indirect costs by limiting the types of printing work done at the main plant in order to increase economies of scale, similar to the approach used by many private printing companies;
- reduce main plant overhead, including the possibility of reducing overnight operations if the *Congressional Record* and/or *Federal Register* are extensively disseminated in electronic formats rather than in paper and microfiche;
- continue to look for opportunities to incorporate cost-saving technology into the conventional printing process, and to make further upgrades in the efficiency of the main plant building; and
- seek congressional approval of an annual appropriation to cover some or all GPO overhead costs.

Timeliness

The timeliness and quality of GPO printing are two other aspects included in the 1983 GPO survey and 1987 GAO and FPC surveys. The survey results vary and are difficult to interpret and compare, given the different survey methodologies utilized. OTA's review of GPO data on the timeliness of printing jobs, measured as the percentage of jobs that are late or delinquent, suggests the following:

- First, the timeliness of GPO procured printing appears to be relatively constant, with about seven percent of all procured printing jobs delinquent over the fiscal year 1983 to fiscal year 1987 period.
- Second, there is little difference in deliquency rates between GPO regional and central office procurement. Over 90 percent of GPO procured printing jobs appear to be completed on time regardless of whether printing is procured through the central or a regional office.
- Third, the data do not suggest a widespread delinquency problem, although these delinquency data do not reflect delays due to paperwork and signoff requirements prior to the actual printing procurement.

An evaluation of how serious the seven percent delinquency rate really is requires information not available to OTA. Such an evaluation would require information on: the degree of delinquency (how many days or weeks late); the reason(s) for the delinquency; the impact(s) of the delinquency on the GPO customer; and the general performance level of the private printing industry in performing comparable work. GPO procured printing delinquency data are shown in Table 11-16.

Table 11-16.—GPO Procured Printing, Percent of Jobs Delinquent, by Fiscal Year

Fiscal year	GPO Regional Office procured jobs	GPO Central Office procured jobs
1983	6.7	7.8
1984	6.8	7.5
1985	6.4	6.4
1986	6.5	6.8
1987	6.8	8.2
1988 (January-June)	6.6	7.6

SOURCE: U.S. Government Printing Office, 1988.

OTA also reviewed delinquency data for jobs printed inhouse at the GPO mainplant. The data indicate that, for fiscal year 1987, the delinquency rate for main plant printing jobs was about double that of procured printing jobs. And the delinquency rate for executive agency printing jobs was about triple that of procured printing jobs. This suggests that, at least relative to GPO procured printing, timeliness is a significant problem for GPO main plant printing. However, several caveats are in order. First, GPO data indicate that more than half of the delinquencies are 5 days or less. Second, a complete evaluation would require the types of information noted earlier for procured printing. Third, central plant printing is subject to unique circumstances that require assigning high priority on short notice to certain congressional work. Priority congressional jobs thus can delay other congressional jobs as well as executive agency work, which contributes to a higher delinquency rate. Solving this problem could necessitate congressional action to smooth the work flow, encourage realistic delivery estimates, and limit priority work. In any event, GPO routinely could provide customers with explanations of any delays over, say, five days, in order to facilitate customer understanding and target improvement efforts when needed. The main plant delinquency rates are shown in Table 11-17.

Quality

In addition to timeliness data, OTA examined GPO data on the quality of printing jobs. GPO has developed a Quality Assurance Through Attributes Program (QATAP). Under this program, five quality levels are defined, ranging from Level 5, duplicating (or lowest) quality, to Level 1, precise (or highest) quality. GPO has defined an acceptable defect (or error) rate as 6.5 defects per 100 items (i.e., publication, pamphlet, book, etc.). The results of GPO quality audits for fiscal year 1987 in-

Table 11-17.—GPO Main Plant Printing, Percent of Jobs Delinquent, Fiscal Year 1987

Total Main Plant jobs	9,739	
Delinquent jobs	1,492	
Percent delinquent		15.3%
Total Congressional jobs	7,558	
Delinquent jobs	1,006	
Percent delinquent		13.3%
Total Executive Agency jobs	2,181	
Delinquent jobs	486	
Percent delinquent		22.3%
Degree of delinquency, all jobs		
3-5 days		58%
6-10 days		25%
11-15 days		9%
16-20 days		3%
21 or more days		5%

SOURCE: U.S. Government Printing Office, 1988.

dicate very low defect rates for procured printing, averaging about 1.7 defects per 100 items for the 540 jobs sampled, well within the acceptable rate. Only 9 of the 540 sample jobs were rejected due to unacceptable quality. For GPO central office inplant printing, the defect rate was somewhat higher at about 4.3 defects per 100 items, but still within the acceptable rate. However, the quality of inplant congressional work was somewhat better than inplant executive agency work, 2.5 versus 5.6 defects per 100 items, respectively. Also, a comparison of quality levels for inhouse versus procured agency work for fiscal year 1988 through May indicates that procured printing quality is higher than inplant printing quality, and that the inplant defect rate exceeded the acceptable level in some reporting periods. These results warrant further study by GPO to determine why these quality differentials exist and whether they present any problems to customers. The detailed comparative data for inplant versus procured agency work are shown in Table 11-18 for the most common quality levels.

Cost Estimating and Billing Procedures

Cost estimating is another area that appears to be in need of improvement, based on the 1983 GPO survey and 1987 FPC survey (GAO did not survey agencies on this item). The GPO survey found that about half of the respondents did not receive accurate and timely cost estimates most or all of the time, as summarized in Table 11-19. Since this survey is 5 years old, an update survey by the GPO Audit Group appears to be warranted. The updated results would provide some indication of whether and how much agency perceptions may have changed in this and many other areas.

With regard to details on actual cost and billing information, GPO makes such information available on request to GPO customers. However, this places the burden on the customer to take the initiative. One possible solution would be for GPO to provide itemized billing for all inhouse printing and for procured printing when the actual printing cost differs significantly (i.e., plus or minus 10 percent) from the estimated cost. The itemized, detailed billing information might:

- eliminate most agency concerns,
- help agencies better understand the economics of printing, and
- facilitate followup when serious cost estimating or billing errors are thought to have occured.

GPO also could encourage greater agency use of the existing Billing Information Center "telephone hotline" to resolve billing questions, and the online Procurement Information and Control System (PICS), which provides assistance in developing job estimates and tracks the status of procured printing jobs. According to GPO, 35 agencies have direct electronic access to PICS, with several more on the waiting list to be connected. Should GPO opt for itemized billing, it is possible that only modest modifications to existing management information systems would be needed.

General Themes

The first general theme that emerged from OTA's study is the need for even stronger cooperative working relationships between agency printers and publishers and GPO staff. The membership and mission of the Public Printer's Interagency Advisory Council on Printing and Publishing could be reviewed to ensure appropriate balance. To some extent, FPC has been

Table 11-18.—Results of GPO Quality Audits, Number of Defects Per 100 Items, Inplant v. Procured Agency Printing

	Quality level 3		Quality level 4	
Time period[a]	Inplant	Procured	Inplant	Procured
July 87-Oct 87	3.5	3.8	2.3	0.0
Aug 87-Nov 87	8.2	6.0	3.8	0.0
Sept 87-Dec 87	7.1	5.2	3.3	0.0
Oct 87-Jan 88	7.2	3.0	1.9	0.0
Nov 87-Feb 88	6.7	1.4	3.5	0.0
Dec 87-Mar 88	3.5	1.3	4.5	0.0
Jan 88-April 88	3.5	1.2	4.9	0.0
Feb 88-May 88	2.6	1.2	6.7	2.3

[a] Four-month Moving Average

SOURCE: U.S. Government Printing Office, 1988.

Table 11-19.—Agency Views on GPO Cost Estimates, 1983 Survey

Question: How often are the GPO cost estimates accurate and, when received, timely?

	Accurate	Timely
Always/most of the time	42.4	38.4
Some of the time	34.4	30.4
Infrequently	7.2	14.4
Never	2.4	8.0
Do not receive estimates	5.6	2.4
Do not know	2.4	0.0
Undecided	0.8	0.0
No response	4.8	6.4

SOURCE: U.S. Government Printing Office, 1983.

attempting to compensate for the limited representation of agency publishers on the Public Printer's Advisory Council. Also, GPO may wish to consider establishing an advisory council for the Superintendent of Documents (SupDocs). One early objective of such a group could be to advise SupDocs on the completion of a marketing information system now under development. At present, it is difficult for SupDocs to generate information on the results of marketing efforts for specific agency products. Also, such a council could be even more important to the extent SubDocs extends its sales program to include a significant offering of electronic formats.

The second general theme is the need for better coordination and cooperation between publishers, printers, public information officers, financial and procurement officers (responsible for billing and cost control), and the like within the agencies. While this is outside the direct purview of GPO, it is directly relevant to GPO since coordination problems within customer agencies can create or aggravate problems between the agencies and GPO. This topic could be addressed by the Public Printer's Advisory Council, a SupDocs advisory group if created, the Federal Publishers Committee, and agency IRM officers.

OTA identified several other areas for potential improvement in conventional printing operations that, while outside the scope of this study, warrant attention. These include:

- *Use of nonacidic paper for printing of books, reports, and other materials with archival value.* As discussed in OTA's separate May 1988 report on *Book Preservation Technologies*, the use of acidic paper for printing has contributed to extensive deterioration of older books and other documents. This is considered one of the major problems facing the library and archival community. One part of the solution is to increase the use of nonacidic paper which has greater longevity. Even though GPO consumes a very small percentage of the nation's annual paper production, GPO could take a leadership position in promoting the use of nonacidic paper for Federal Government printing and in so doing provide an element of leadership to the private and international printing and publishing community. Also, GPO experience to date suggests that nonacidic paper can be cost competitive and meet other technical requirements. Accordingly, GPO has prepared and submitted to the JCP on interim specification on nonacidic paper.

- *Use of alternative printing inks (such as soy-based).* Concern over disposal of hazardous wastes generated in part by conventional printing inks has generated increased interest in alternative inks. One alternative is soybean-based ink. While early GPO tests were unsuccessful, soybean-oil based inks are licensed by the American Newspaper Publishers Association, available at competitive prices, and used successfully by various newspapers. GPO is conducting, at congressional request, an economic and technical feasibility study of printing the *Congressional Record* and *Federal Register* with soy ink.
- *Use of expert systems software for printing management.* Effective management of printing activities involves the optimal selection of equipment for a given document type, length, press run, and the like multiplied, in the case of GPO, many times over due to the wide variety of types of equipment, printing and staffing requirements, and customer demand (in terms of document type and cost, timeliness, and quality considerations). GPO uses a complex process to make decisions on whether to produce a job inhouse or procure it commercially, and must take into account such factors as the requested delivery date, security classification, availability of paper and/or materials, and production capacity. The latter is a function of work-in progress at various stages of the printing process and the projected progress of jobs toward completion. This type of decision framework appears ideally suited to expert systems software. GPO could experiment with several types of off-the-shelf expert systems software available from private vendors and develop its own application starting with one of the commercially-available expert system shells. Expert systems software should be able to improve GPO decisionmaking and could eventually be offered to customer agencies to assist their decisionmaking.

Chapter 12

Setting Future Directions for the Superintendent of Documents and National Technical Information Service

From the top: the GPO computer room (photo credit: U.S. Government Printing Office); and NTIS staff helps customer with document selection (photo credit: National Technical Information Service).

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Chapter 12

Setting Future Directions for the Superintendent of Documents and National Technical Information Service

SUMMARY

Any electronic future for the Superintendant of Documents (SupDocs) within the U.S. Government Printing Office (GPO) and for the National Technical Information Service (NTIS) must take into account the increasingly decentralized, competitive environment that characterizes the electronic information marketplace. The Federal Government is moving in the direction of electronic information systems at the heart of most agency activities. Of particular significance for SupDocs and NTIS are the technological advances that are changing or blurring the traditional distinctions between printing and dissemination, reports and databases, and the roles of individual mission agencies (and the private sector) versus governmentwide dissemination agencies. This chapter addresses current and future opportunities for these two agencies and the broader implications of expanded roles in electronic dissemination.

In the long-term (10 to 20 years), the myriad of possible information dissemination alternatives facilitated by technological advances could transcend the current institutional framework. Full understanding of long-term alternatives will require several years of pilot tests, demonstrations, and experiments and related evaluation studies. Consideration of various alternatives needs to accommodate the results and "lessons learned" or run a high risk of failure.

In the short-term (3 to 5 years) and possibly medium-term (5 to 10 years), the future is more certain, and the basis for setting directions better established. Over at least this time frame, the need for some governmentwide information dissemination mechanisms is likely to continue. In the short- to medium-term, there are a number of institutional alternatives for SupDocs/NTIS electronic information dissemination, ranging from a highly centralized information dissemination infrastructure to fully privatized approaches, and all with various advantages and disadvantages.

The middle-ground alternative of including selected electronic formats in the SupDocs and NTIS sales programs, with individual agencies disseminating electronic products as well as private vendors reselling or further enhancing Federal electronic products, would appear to have significant favorable impacts on: public access, government productivity and cost-effectiveness, agency missions, the private sector economy, and international leadership. However, to implement this alternative, both SupDocs and NTIS would need to:

- obtain the necessary additional technical expertise,
- strengthen strategic planning capability,
- increase participation in governmentwide standard-setting and innovation activities,
- strengthen pilot testing and demonstration programs, and
- invest in state-of-the-art electronic equipment.

The middle-ground alternative is likely to have generally beneficial effects on business users of Federal information, especially small businesses. The information technology equipment and services industry and the printing industry are not likely to be significantly affected. Nor does it appear that SupDocs/NTIS offering electronic formats would pose any significant competitive or economic threat to the

commercial information industry as a whole. However, there could be a significant impact on a small segment of the industry—those firms that specialize in government information. The impact could be favorable, if new opportunities for repackaged or further enhanced private offerings would result. And there is also the option of the SupDocs or NTIS contracting with various of these firms, perhaps at volume discount rates, where direct competition might exist.

INTRODUCTION

Previous chapters have discussed overall trends in technology, applications, user needs, and public policy issues that are relevant to the future of GPO and NTIS. The purpose here is to present a broader framework for setting directions for GPO and NTIS with respect to electronic dissemination.

This chapter begins with a discussion of the increasingly competitive environment that faces GPO and NTIS with respect to electronic dissemination, as contrasted with dissemination of paper formats.

The chapter then considers a number of institutional alternatives for implementing GPO and NTIS roles in electronic dissemination. The future of these two institutions needs to be considered together, if for no other reason than the potential overlap with respect to sales of electronic formats. The institutional alternatives range from:

- a fully centralized, consolidated governmentwide approach to electronic dissemination;
- to separate roles for GPO and NTIS for the legislative and executive branches, respectively;
- to a consolidated SupDocs and NTIS, possibly within a new Government Information Office or the equivalent; and
- to a privatized SupDocs and NTIS.

Finally, the chapter discusses some of the implications of an electronic GPO and NTIS for government productivity, agency missions, and impacts on the private sector, among other areas.

THE COMPETITIVE ELECTRONIC ENVIRONMENT

A major trend relevant to designing an electronic future for GPO and NTIS is the increasingly decentralized, competitive environment that characterizes the electronic information marketplace. Whereas the technology and economies-of-scale of paper formats tend to favor centralized approaches (at least for larger press runs and/or more complex documents), electronic formats lend themselves to decentralized approaches.

The Federal Government is moving in the direction of employing electronic information systems at the heart of most agency activities, including the collection, processing, and dissemination of information. The nature of this transition was discussed in earlier chapters (especially chs. 2, 3, 4, 5, and 6), and is driven by the following key technological factors:

- a series of technological breakthroughs that make electronic dissemination of Federal information a viable option for many purposes;
- development of technology and related technical standards that offer, for the first time, the near-term prospect for integrated information systems utilizing the "information life cycle" concept whereby the collection, processing, analysis, storage, and dissemination (and ultimately retention or archiving) of information in multiple formats (paper, microfiche, and electronic) are viewed and implemented as interrelated

functions rather than separate, unrelated activities;
- a significant increase in the demand for Federal information in electronic formats among various user groups, and especially the library community, private industry, Federal agencies themselves, and various groups or individuals with specialized needs (such as disabled or handicapped persons, educators, and rural citizens);
- a substantial ongoing investment by the Federal mission agencies in agency automation that, if planned and implemented properly, can incorporate multi-format information dissemination at little additional marginal cost compared to the total cost of automation and with significant net cost savings for agency information functions; and
- a rapidly growing base of Federal agency experience with pilot tests and applications of new electronic technology to Federal information dissemination.

Technological advances are changing or blurring the traditional distinctions between printing and dissemination, reports and databases, and the roles of individual mission agencies (and the private sector) versus government-wide dissemination agencies. This trend is particularly significant when considering alternative futures for GPO and NTIS.

First, technological advances are changing or even eliminating the distinctions between information creation, storage, printing, and dissemination. The integrated information system using the "information life cycle concept" is a plausible template for future Federal (and private sector) information dissemination. This means that information is captured in electronic form when collected or created and is retained in electronic form through whatever revision and processing cycles are needed. The information can then be converted into multiple output formats from the same electronic database. Illustrative output formats include:

- laser printing for proof copies and short press runs of paper documents,
- phototypesetting and offset press printing for higher quality and/or longer press runs of paper documents,
- remote printing-on-demand using telecommunications and laser printers,
- optical disks (including high volume Compact Disk-Read Only Memory [CD-ROM] production),
- magnetic tape and diskettes,
- microform, and
- online electronic access.

Second, technological advances are changing or even, in some cases, eliminating at least the technical distinctions between reports, publications, databases, records, and the like. One template for the future is that almost all types of Federal information will exist in electronic form as an electronic database on a computerized system. The government and/or user will have a wide variety of output formats to choose from. For example, a typical 200 page OTA report could be available as:

- a high quality printed report,
- a microfiche,
- an online electronic file for information retrieval and selective printing-on-demand, and
- one of several electronic files on a CD-ROM.

All of these products could be derived from the same electronic database. The type of output format would vary, of course, depending on the type of information and the desired use.

Third, technological advances are blurring the distinctions between the institutional roles of Federal agencies involved with information dissemination. For example, today the Federal mission agencies generally collect and create Federal information products that are disseminated in paper formats via the SupDocs, Depository Library Program (DLP), NTIS, and/or Consumer Information Center (CIC), depending on the nature of and demand for each particular document. A small portion of paper or microfiche documents are reprinted by private publishers, and an even smaller percentage are placed online or in other electronic formats.

In contrast, an agency electronic database (whether a report, model, or statistical series) could, from a technical feasibility standpoint, be electronically disseminated directly from the agency to agency clients, to information users, and to the depository libraries, bypassing the SupDocs, NTIS, and CIC. Or the agency database could be disseminated via one or more governmentwide clearinghouse mechanisms. These could be the SupDocs/GPO or NTIS or CIC, but could also be the National Library of Medicine (NLM), National Agricultural Library (NAL), Library of Congress (LOC), and/or any of a variety of commercial electronic "gateways" used by the government. Also, since the electronic form of the agency database would not be copyrightable and assuming it is accessible under the Freedom of Information Act (FOIA) if not directly available, the database could be repackaged or enhanced by private information vendors. There are many possible combinations.

In sum, the myriad of possible information dissemination alternatives facilitated by technological advances could transcend the current institutional framework. The current framework, including the roles of GPO and NTIS and the relevant statutory provisions, was developed over decades largely to accommodate an historical era when Federal information was collected, stored, printed, and distributed only in paper format.

The advent of electronic information technology has contributed to the complexity and competitiveness of the current Federal information environment. While there is an urgent need for setting future directions, consideration of various alternatives needs to accommodate this complexity or run a high risk of failure. Thus, planning the future of such institutions as the GPO and NTIS is both blessed with many new opportunities, but fraught with new uncertainties and complexities since their future is inextricably tied to that of the overall Federal information dissemination enterprise.

In setting future directions for GPO and NTIS, a two-track strategy warrants serious consideration: long-term, and short to medium-term. For the very long-term (10 to 20 years), the advancing technology and the by then almost fully automated Federal information infrastructure are likely to facilitate Federal electronic information dissemination in several different ways. These possibilities include:

- dissemination of Federal electronic information products directly from Federal agencies to customers using agency or Federal telecommunication networks for online products, and the U.S. mail and/or private courier services for offline products (e.g., CD-ROM, floppy disk, paper copies);
- electronic (online) dissemination as above and/or the use of commercial or nonprofit electronic gateway or networking services, including those offered by telephone and value-added carriers;
- electronic (online) dissemination by Federal agencies using one or more government-operated electronic gateways, clearinghouses, or switching centers—operated by GPO, NTIS, or another agency—not unlike those being developed by NLM and the Defense Technical Information Center (DTIC);
- production of offline electronic information products (e.g., tapes and disks) by Federal agencies directly or by agency contractors, and/or by GPO (or the equivalent central government electronic publishing office);
- sale of offline information products by Federal agencies directly or by agency contractors, and/or by GPO or NTIS (or the equivalent central government information sales office); and
- sale of repackaged and value-added Federal information products by a wide range of private vendors, including both online and offline information products and both profit and nonprofit sales outlets.

The range of technologies and technical trends discussed in earlier chapters (see especially ch. 3) could, in the long-term, be deployed to support a wide range of institutional roles and responsibilities in Federal information dissemination. It is likely that most sectors of American society will, in the long-term, make extensive use of microcomputers in the home, community, and office. There will also be easy access to desktop publishing and online information retrieval capabilities interconnected via a plethora of governmental, commercial, and nonprofit networks, gateways, and database services. These electronic interconnections will be facilitated by a robust offering of satellite, fiber optic, microwave, cable, and hybrid transmission systems. It is also likely that most sectors of American society will have (or have access to) microcomputer-based expert systems software to assist with information search, retrieval, and management, and optical disk systems for storage and manipulation of large volumes of information.

A full understanding of the long-term alternatives and implications for Federal information dissemination will require several years of pilot tests, demonstrations, and experiments and related evaluation studies. These demonstrations will provide information crucial to setting future long-term directions, including future directions for GPO and NTIS. Many Federal mission agencies, GPO, and various private sector commercial and nonprofit organizations have tests and demonstrations underway. More are planned. And NTIS is giving attention to a demonstration program as well.

In the short-term (within 3 to 5 years) and possibly the medium-term (5 to 10 years), the future is more certain, and the basis for setting directions better established.

In setting short-term directions for GPO and NTIS, the issues discussed in chapter 11 (and ch. 7 regarding depository libraries) need to be considered as well as the electronic alternatives discussed in chapters 4, 5, and 7. The key directions involve the following elements:

- GPO provision of electronic publishing support to Federal agencies (recognizing that GPO will be competing with both agency inhouse capabilities and private sector electronic publishing service bureau capabilities);
- SupDocs sales of electronic formats (recognizing that SupDocs will be competing with some private vendors, some Federal agencies who choose to sell their own electronic products, unless directed otherwise, and possibly NTIS, unless close coordination with SupDocs is maintained);
- NTIS sales of electronic formats (recognizing potential competition with SupDocs, vendors, and agencies, as above); and
- SupDocs distribution of electronic formats to the depository libraries (recognizing that libraries may also be receiving Federal electronic information from commercial vendors and nonprofit organizations as well as direct from some agencies).

Possibilities for GPO electronic publishing support have been discussed in chapter 4, and electronic dissemination to depository libraries in chapter 7. Technical aspects of SupDocs and NTIS electronic document sales were discussed in chapters 4 and 5. The remainder of this chapter considers a variety of institutional alternatives for and broader implications of implementing SupDocs and NTIS electronic sales programs.

This discussion assumes that the basic need for sales of government information continues, as reflected in the statutory and other congressional policy guidance applicable to GPO and NTIS, and that some kind of governmentwide information dissemination mechanisms are needed for at least the medium-term. This latter assumption reflects the reality that the information life cycle concept, multi-format output, decentralized networking, and the like will take many years to fully implement in the Federal Government. Governmentwide dissemination approaches are needed to minimize the burden on and hopefully the cost to the customers and also to ensure broad public access. Also, the results of the GAO surveys of Federal agencies (ch. 2) and Federal information users (chs. 4 and 5) suggest a significant and continuing need for the kinds of functions performed by SupDocs and NTIS in the dissemination of Federal information.[1]

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[1] For further relevant discussion of GPO, DLP, and NTIS, see, for example, Peter Hernon and Charles R. McClure, *Fed-*

(continued on next page)

INSTITUTIONAL ALTERNATIVES FOR SUPDOCS AND NTIS ELECTRONIC INFORMATION DISSEMINATION

The following institutional alternatives for SupDocs and/or NTIS are discussed in this section:

- centralizing all or most government dissemination functions in one office or agency,
- privatizing SupDocs and NTIS,
- reorganizing SupDocs as part of a legislative printing office,
- consolidating NTIS with SupDocs and/or reorganizing as a "Government Information Office" or "Government Information Corporation," and
- authorizing SupDocs or the consolidated SupDocs/NTIS to produce and disseminate Federal information in all formats.

Centralizing Government Electronic Information Dissemination

Under this alternative, dissemination of Federal electronic information products, whether for sale or for free, would be permitted only through SupDocs or the equivalent. NTIS and mission agencies would no longer be authorized to disseminate electronic information directly to the public. This alternative was strongly opposed by many Federal executive agency officials. Agency officials believe that Federal information activities and users are so diverse and complex that centralizing expertise on these information activities and users would be very difficult. They argue that close interaction between information providers and users is essential not only for effective dissemination, but also for effective development of the information products and services.

The major benefits of totally centralized electronic information dissemination are easier public access and reduced overlap and duplication in government information functions. However, attempts to centralize electronic dissemination to this high degree would likely be heavily resisted with chaotic and possibly detrimental net impacts on public access. Also the central dissemination agency probably would require increased financial and organizational resources which probably would not be offset by cost and organizational reductions in the mission agencies. Agencies would be likely to retain as many functions as they could on the grounds that most extant personnel and capabilities are necessary to the creation of the electronic information products, regardless of how and by whom the products were disseminated.

The centralized alternative was also criticized as increasing the risks of excessive or improper control over or manipulation of Federal electronic information dissemination, and as inconsistent with the checks and balances inherent in diversity and decentralization of information control. In addition, if the central information office were located in the legislative branch, the alternative would be likely to exacerbate separation of powers issues. Many Federal agency officials participating in the OTA study expressed considerable support for the central index and standards (discussed in

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eral Information Policies in the 1980's: Conflicts and Issues (Ablex: Norwood, New Jersey, 1987); Charles R. McClure, Peter Hernon, and Gary R. Purcell, *Linking the U.S. National Technical Information Service With Academic and Public Libraries* (Ablex: Norwood, New Jersey, 1986); and Peter Hernon, Charles R. McClure, and Gary P. Purcell, *GPO's Depository Library Program: A Descriptive Analysis* (Ablex: Norwood, New Jersey, 1985). For discussion of longer-term technological and societal futures, see, for example, Alvin Toffler, *The Third Wave*, William Morrow (New York, NY, 1980); John Naisbitt, *Megatrends* (Warner Books: New York, NY, 1980); Benjamin M. Compaine, *Information Technology and Cultural Change: Toward A New Literacy?* (Harvard University Program on Information Resources Policy: Cambridge, MA, 1984), U.S. Congress, Office of Technology Assessment, *Intellectual Property Rights in an Age of Electronics and Information*, OTA-CIT-302, April 1986; Clement Bezold and Robert Olson, *The Information Millenium: Alternative Futures*, Report prepared by The Institute for Alternative Futures for the Information Industry Association (Washington, DC, November 1986); and U.S. Congress, *Communication Systems for an Information Age*, OTA-CIT, forthcoming Spring 1989.

ch. 11), but not as part of a totally centralized institutional alternative.

Another variation of the centralized alternative would be to combine the electronic information sales functions of the mission agencies in one central office, such as SupDocs or a Government Information Office. Agencies could continue to otherwise disseminate their own information as they do today. At present, agency electronic information product sales are handled directly by the agency or in some cases by the NTIS clearinghouse and/or by interagency agreement with NTIS or in a very few cases by SupDocs. Agency sales of paper formats are handled by SupDocs for items accepted into the SupDocs sales program (including subscriptions to agency periodicals), by the agency for other paper formats, and by NTIS for items included in the NTIS clearinghouse. Under a more centralized arrangement, all sales functions (for both paper and electronic formats) would be combined in one office (which could be SupDocs, NTIS, a consolidated SupDocs/NTIS, or a Government Information Office). Agencies would still handle free dissemination of their own information products, except for items handled through CIC.

This partially centralized alternative is viewed by many Federal executive agency officials participating in the OTA study as less threatening than a fully centralized government information dissemination function. However, any mandatory requirement to sell electronic formats solely through a central government office would conflict with numerous existing agency activities, be likely to meet considerable agency opposition, and could precipitate legal and political challenges to the statutory basis for such a requirement.

A third variation of the centralized alternative would be for SupDocs or NTIS or a consolidated SupDocs/NTIS to include selected agency electronic information products in the SupDocs or NTIS or combined sales program, but not to the mandatory mutual exclusion of agency sales. Under this alternative, agencies could decide to rely entirely on a centralized sales office, but this would be at agency discretion. While this alternative would mean some degree of overlap and duplication in sales activities, it would strengthen the governmentwide information dissemination mechanisms while at the same time preserving a considerable degree of agency independence with respect to their own information dissemination activities. (This alternative is discussed further later in this chapter.)

Privatizing SupDocs and NTIS

Privatizing NTIS has been advocated by the Administration over the last several years, and, from time to time, privatizing GPO has been suggested. Some other countries have privatized both government printing and document sales functions. Theoretically, a Federal electronic information sales program could be contracted out to the private sector. Three major criteria for evaluating privatization proposals are: the inherently governmental (versus commercial) nature of the government activity; the cost-effectiveness of privatization to the government; and the impact of privatization on the commercial marketplace.

Inherently Governmental v. Commercial Functions

NTIS and SupDocs activities are generically similar to private sector functions. Certainly private firms can and do carry out information clearinghouse, printing, marketing, sales, and dissemination activities. However, NTIS and SupDocs are arguably inherently governmental because they:

- operate pursuant to public law,
- carry out important public responsibilities in promoting public access to Federal information,
- facilitate an informed citizenry,
- assist the mission agencies in carrying out their statutory responsibilities, and
- advance scientific and technical progress in the United States as is especially the case with NTIS.

Second, NTIS and SupDocs receive almost all of their source materials from other Federal agencies, on a voluntary basis in the case of NTIS and subject to Title 44 requirements for SupDocs. There is no guarantee or requirement that Federal agencies would continue to provide information to a privatized NTIS, and, indeed, some Federal science agencies have said that they would not. The possibility of requiring Federal agencies to participate in a privatized publication sales program in lieu of the SupDocs program would appear to raise serious legal problems (including the necessity to amend Title 44 and possible ramifications for numerous statutes), and some agencies might be expected to not cooperate with a privatized SupDocs.

Third, both NTIS and SupDocs have active programs for the international exchange of reports and materials with various countries. This is an important element in the free and open flow of information between governments and across national boundaries. There is no guarantee or requirement that foreign countries would continue to cooperate with a privatized NTIS and SupDocs. In the debate over NTIS privatization, some foreign governments indicated serious concerns about cooperating with a privatized NTIS.

Fourth, both NTIS and SupDocs carry out a variety of other functions, some explicitly required by statute, others on a voluntary, reimbursable basis for various Federal agencies. For example, NTIS is responsible for technology transfer, patent licensing, and Japanese literature translation programs, and also for reimbursable information processing and sales for other agencies. Also, NTIS serves as an outlet for FOIA requests (for materials placed by agencies in NTIS) and as the repository for OMB-mandated agency inventories of electronic information products. SupDocs is responsible for administering DLP and also operates the CIC on a reimbursable basis for the General Services Administration (GSA). The debate over NTIS privatization suggests that many of these kinds of activities are not amenable to privatization.

In sum, both NTIS and SupDocs have developed a complex, intricate web of relationships with Federal agencies (and other governments) and carry out numerous functions that are either required by law or that support the ability of other agencies to fulfill their statutory obligations.

Cost-Effectiveness

The cost-effectiveness of privatizing NTIS or SupDocs has yet to be established. With respect to NTIS, analyses conducted by the Department of Commerce concluded that privatization would cost—not save—the Government money. A cost-effectiveness study would need to consider not only transition costs and residual costs to the government but also the costs to all relevant government agencies—not just the Department of Commerce (for NTIS) or GPO or Congress (for SupDocs). For example, NTIS performs roughly $1 million worth of reimbursable production services per year for other agencies, and also performs billing and collection services through reimbursable agreements with NLM, DTIC, and NAL. The financial impact on these and other agencies would need to be considered.

As another example, SupDocs is able to obtain copies of agency reports at marginal rather than full cost by "riding" the agency orders for the additional copies needed for SupDocs sales and depository library distribution. If SupDocs were privatized and many agencies no longer cooperated, the SupDocs cost of obtaining copies would be likely to increase significantly, thereby increasing the cost to the customers (of SupDocs sales) and taxpayers (who finance DLP distribution).

In addition, a cost-effectiveness study would need to consider NTIS and SupDocs privatization in light of the plans and activities of other Federal agencies with respect to Federal information dissemination. Most of these agencies are pursuing a variety of technical options, with numerous possible implications for the future of NTIS and SupDocs—whether privatized or not. For example, DTIC, which accounts for roughly one-quarter of NTIS source materials, is planning to shift to an optical disk-based electronic printing-on-demand operation. This and similar actions by other Federal agencies could have major implications for how and what information is transmitted to NTIS and/or SupDocs. The opportunities to improve cost-effectiveness (e.g., via the information life cycle with multi-format output) could be complicated if NTIS and SupDocs were privatized.

Finally, both NTIS and SupDocs operate with no public appropriations for their basic sales functions. NTIS operates on a break-even basis with annual revenues and costs of roughly $22 million and no appropriation for the basic NTIS collection, archiving, clearinghouse, and dissemination functions. The SupDocs sales program is totally self-supporting, and in recent years has actually been returning a net annual profit of several million dollars on annual sales in the $70 million range. This makes it especially difficult to establish the cost-effectiveness of privatization.

Impact on the Private Marketplace

Most NTIS and SupDocs documents are not copyrightable, since documents prepared by or for the Federal Government at public expense cannot be copyrighted. This means that any individual or organization can resell NTIS and SupDocs reports without authorization from or reimbursement to the government, and that the government has no legal basis for preventing such sales. Indeed, some private vendors do resell various NTIS and SupDocs documents based on their own evaluation of the marketplace. Vendors need only buy one copy of the government document and can (and do) use it as camera-ready copy (with a new cover and title page). In this way, the vendor eliminates the keyboarding, layout, and composition costs, which could otherwise be substantial. When documents are available in magnetic tape format from SupDocs, some vendors buy the tapes and convert them into online formats, and more recently CD-ROM formats.

Thus privatizing NTIS and SupDocs would not appear to make a difference at least with respect to private marketplace availability of paper formats, since these are already readily available at very nominal cost to any vendor who wishes to resell or enhance these materials.

With respect to NTIS privatization, views of the information industry span a broad spectrum, including those that oppose full privatization due to concern about adverse effects on those firms that are already in the market of reselling or adding value to NTIS documents. The same generic concern could apply as well to SupDocs privatization.

Several private firms already realize several million dollars in annual revenues from selling the NTIS bibliography in electronic online format and reselling various NTIS products. To the extent that NTIS (or SupDocs) privatization provided market advantages to a prospective contractor, such as the opportunity to develop and sell value-added products and services as long as certain core functions were carried out, it could have adverse effects on those firms that are or would like to resell or enhance government materials. A potential problem, from an industry point of view, is that one firm (the contractor) would be granted a preferred competitive position by the Government. From the governmental and public access perspective, a potential problem is that significant user groups could be priced out of the value-added market, unless there is some kind of effective "information lifeline" or "information safety net" protection.

There is also concern within the information industry about the competitive impacts of governmental electronic offerings. Possible effects of NTIS and SupDocs electronic sales on the private information marketplace are discussed in a later section.

Reorganizing SupDocs as Part of a Legislative Printing Office

Another institutional possibility is to limit SupDocs to legislative branch information products (NTIS would remain in the executive branch). This legislative branch SupDocs alternative would require statutory changes and would presumably be part of a legislative branch GPO (sometimes referred to as a Legislative Printing Office or LPO). The rationale for an LPO is as follows.

At present, GPO is a statutory agency of the legislative branch of the government, but with its chief officer (the Public Printer) appointed by the President, and with roughly seven/eighths of its total printing work done for the executive branch. The split between legislative and executive printing is about 50:50 for the GPO main plant, and almost all procured work is done for executive agencies. If key governmental process items (such as the *Federal Register*, Budget of the United States, passports, postal cards) are included with the congressional work, then the legislative to executive split would be about 75:25 at the main plant.

One possible scenario would be to transfer the GPO procurement function to GSA in the executive branch, gradually phase out executive branch filler work at the GPO mainplant (or place such work on an agency discretionary basis), and limit GPO's inplant work to congressional and specified key governmental items. This alternative would eliminate any separation of powers issues, especially if the Public Printer were made a congressional rather than presidential appointment. This also would permit GPO to focus or refocus on legislative branch needs and avoid the frequently conflicting requirements of the executive branch. GPO began as almost exclusively the legislative branch printer, with the few executive branch items produced as congressional documents. But executive branch work has gradually increased to the point today where only about one-eighth of total work is purely congressional. This alternative might also make it somewhat easier for GPO to actively pursue a variety of electronic options for congressional information dissemination by focusing attention and resources on just one branch of government.

However, this so-called legislative branch alternative has several limitations. First, separating the printing procurement function from printing operations may, over time, reduce the competence and effectiveness of the procurement staff. Establishing a separate executive branch printer (in addition to the existing GPO) might solve this problem, but at a substantial additional cost. Second, the cost of congressional printing would increase significantly, all other things being equal. Executive agency work done at the GPO main plant helps to take up slack capacity during periods of lower congressional work load. GPO must staff up to handle peak congressional work load, and thus executive branch work helps utilize some of this capacity during off-peak periods. Without executive agency work, total GPO costs would be spread over a smaller base, thus increasing the per unit cost of the remaining work. The cost impact would be lessened to the extent a legislative branch GPO was able to retain adequate executive branch work on a voluntary basis, perhaps partly through the use of special rates for GPO main plant work that more closely approximate procured printing rates (see discussion in chs. 4 and 11). Third, the cost increases would probably necessitate significant GPO labor force reductions, which in the worst case could be as much as 40 percent of the main plant employees (see ch. 4 for further discussion.)

A fourth potential problem is the reduction in congressional control over agency printing and information dissemination. While the executive branch might view this as an advantage, congressional oversight committees might find it more difficult to keep abreast of agency activities, absent more effective reporting by and cooperation from the executive branch. While some executive agencies are critical of what they perceive as inappropriate micromanagement by some oversight committees, it is not clear whether the agencies (and OMB) would support other, substitute oversight mechanisms. Congress could address oversight concerns, in part, by strengthening and restructuring committee jurisdictions (e.g., by creating a Joint Committee on Government Information) and by statutory amendments providing more specific guidance to the executive agencies.

The implications for SupDocs are several. SupDocs is dependent on the central role of GPO vis-a-vis all government printing, to be aware of what is being printed, assess market potential, ride the printing order for additional copies as needed, and ensure proper distribution to depository libraries. If responsibility for executive branch printing is moved to the executive branch, provision would need to be made to ensure that functions now carried out by SupDocs for the executive branch are continued. This could involve reorganizing existing executive agency public information or printing offices into agency sales offices, or creating new offices if needed, all at what could be significant additional costs. Having the equivalent of multiple SupDocs offices throughout the government might complicate the indexing, cataloging, marketing, quality control, ease of public access to, and international exchange of government documents. In addition, to preserve the integrity of the depository library program, executive agencies would need to advise the legislative branch SupDocs of their publishing activities, and provision would have to made to produce and pay for enough copies to meet depository library needs.

Consolidating NTIS with SupDocs and/or Reorganizing as a "Government Information Office" or Government Corporation

The consolidation of NTIS and SupDocs is a key element of government information legislation introduced in the past two Congresses. The consolidated entity could be located in either the legislative branch or executive branch. An NTIS-GPO consolidation in the legislative branch has received more attention recently, in part as an alternative to NTIS privatization. As noted in chapter 11, the Public Printer has publically stated his willingness to consider and implement this alternative, and the Librarian of Congress has suggested consolidating NTIS with the Library of Congress. In the debate over NTIS privatization, some agency officials and users have stated a preference for NTIS-GPO consolidation over NTIS privatization.

NTIS-GPO consolidation would appear to offer several significant advantages but also create some problems. On the plus side, a consolidation would retain NTIS as a governmental entity, and this is thought to be critically important by Federal science agencies. These agencies are very uncomfortable, from procedural, legal, and philosophic perspectives, with the prospect of dealing with a privatized NTIS. While a consolidated NTIS, presumably located within GPO in the legislative branch, may not be ideal, it appears to be preferable to many when compared with privatization. Also, a consolidation would increase the possibilities of economies of scale, and synergy between NTIS and SupDocs marketing, sales, and distribution programs. A consolidation should eliminate public confusion about their respective roles, and could lead to a more efficient and rationale approach to Federal information dissemination.

NTIS and SupDocs have a lot in common. They are both essentially resellers of information products generated by Federal mission agencies. They both operate on a financially self-sustaining basis (SupDocs actually made a significant profit in recent years), with no public appropriation except for specially mandated activities. Both NTIS and SupDocs are small, although the SupDocs sales program has about three times the total revenues (about $70 million per year versus about $22 million for NTIS). They both develop bibliographic products.

The major differences are that NTIS handles largely scientific and technical material with limited demand (10 copies per item) spread over a large inventory (about 60,000-70,000 items added yearly and a total inventory of roughly 2 million titles), while SupDocs handles the entire range of government publications, but selects items with a larger demand (typically, in the several hundreds to thousands of copies per item) and maintains a much smaller inventory (about 20,000 titles). NTIS has a major archival responsibility, while SupDocs does not (although some of the depository libraries do).

With respect to technology, NTIS is constrained due to the absence of a revolving fund or other mechanism to finance capital investment in new technology (although this would be partially remedied in pending legislation). Since SupDocs printing is done by GPO, SupDocs is an indirect beneficiary of any technology enhancements that GPO finances for its own purposes out of the GPO revolving fund. Also, SupDocs can finance its own capital investment needs out of the GPO revolving fund with the cost recovered as a depreciation charge against sales. It is also possible that SupDocs (and, by extension, NTIS) would be permitted to contribute some portion of net revenues, if any, to the revolving fund to finance new dissemination technology and experiments. In general, the combined activity and resource base of NTIS and SupDocs would appear to offer potential opportunities for testing implementation of new technologies (such as CD-ROM, printing on demand) and marketing techniques. A NTIS-GPO consolidation would also appear to provide potentially fruitful cross-fertilization of staff expertise, and would meet congressional concerns about retaining direct control over vital Federal information dissemination functions.

The major potential problem would appear to be the actual transfer of NTIS from an executive branch agency (Department of Commerce) to a legislative branch agency (GPO). The Department and OMB are likely to oppose this alternative. It could be viewed as further exacerbating concerns about separation of powers and executive control. There would be some costs associated with the transition, although they might be minimal. The cooperation of the Federal science agencies would be essential to make this transfer work.

Rather than moving NTIS to the legislative branch, SupDocs could be transferred to the executive branch and combined with NTIS. Legislation introduced in the past two Congresses would consolidate NTIS and SupDocs (along with a few other agency information sales units) into a Government Information Office to be established as an independent agency of the executive branch. First of all, this legislation would transfer only SupDocs, and not the printing procurement and inplant printing functions of GPO. Theoretically, the entire GPO could be transferred, although this appears unlikely so long as GPO operates as the congressional printer (with highest priority assigned to congressional work).

Part of the rationale for moving SupDocs to the executive branch is to minimize separation of powers problems and facilitate relationships with executive agencies. It is not clear whether separation of powers is really a problem with respect to SupDocs functions. The ongoing debate over the applicability of *Chadha* v. *INS* to certain provisions of Title 44 of the U.S. Code has focused primarily on the constitutionally of the requirement for Joint Committee on Printing advance approval of executive agency printing and related activities, not on the constitutionality of SupDoc functions. Transfer of SupDocs or any or all of the rest of GPO to the executive branch would be likely to aggravate congressional concerns about control over government information dissemination policy. These concerns might be mitigated, to a degree, by strengthening congressional oversight.

A change in name to "Government Information Office" would help demarcate the already well advanced transition of the Federal Government from a world of paper documents and reports to a world of information in all formats, electronic as well as paper and microfiche. A name change need not be limited to an NTIS-SupDocs consolidation. On the down side, in the American political system, there has always been some reluctance to establish central governmental information offices, for fear they will become or at least be perceived as government information control or propaganda instruments. This of course need not and presumably would not be the case for the institutional alternatives discussed above, but it is a concern that warrants attention.

Yet another possibility would be to establish a Government Information Office as a government corporation. This alternative has been seriously proposed and studied for NTIS. The National Academy of Public Administration has reviewed the history and nature of NTIS functions and concluded that NTIS met the commonly accepted criteria for a government corporation, including the need to: be revenue-producing, be self-supporting, and conduct a large number of transactions with the public. The academy also concluded that, despite the requirement to be self-supporting, NTIS is not provided the operational flexibility (for staffing and capital investment, in particular) necessary to respond to market forces. The House Committee on Science, Technology, and Space largely concurred with the Academy's findings, and has included the incorporation of NTIS as a provision of the NBS Authorization Act for fiscal year 1989. (See ch. 11 for discussion.)

The government corporation approach for NTIS would appear to capture some of the benefits that had been suggested from an NTIS-SupDocs consolidation, especially with respect to capital investment. Also, providing NTIS with an explicit statutory charter presumably would strengthen the ability of NTIS to carry out its mission with less interference from OMB and others who have questioned the existence of NTIS as a government entity. On the other hand, the corporation approach as currently proposed would not capture possible marketing, staffing, and technology synergies that might result from an NTIS-SupDocs consolidation. Another alternative would be to extend the current "National Technical Information Corp." concept to include SupDocs (and perhaps some other related government activities, such as those of the Consumer Information Center) to become a "National Government Information Corp."

A full analysis of these alternatives is beyond the scope of this study but would necessitate consideration of all the factors discussed previously, including the implications for: the cost-effectiveness of NTIS and SupDocs functions; the intricate web of relationships between NTIS, SupDocs, and the mission agencies which are the source of NTIS and SupDocs sales items; the implementation of relevant statutes including various provisions of Title 44 of the U.S. Code; and the private sector firms that currently (or might in the future) make a market in reselling or adding value to NTIS and SupDocs materials. It should be noted that in 1986, the Department of Commerce not only recommended against wholesale NTIS privatization, but also recommended against consolidation with GPO or creation of a corporation.

Authorizing SupDocs or the Consolidated SupDocs/NTIS to Produce and Disseminate Electronic Formats

The convergence of several trends has opened up a window of opportunity for SupDocs, or a consolidated SupDocs/NTIS should that alternative be implemented, with respect to the production and dissemination of Federal information in electronic formats as well as paper and microfiche. While paper is expected to be the dominant format for years to come, the GAO survey results (see ch. 2, 4, and 5) document the transition that is already underway. The volume of Federal information products in electronic formats is increasing rapidly. Also, automation of the document creation process in most Federal agencies is proceeding rapidly, such that electronic capture of the original keyboarding should be possible a large percentage of the time, given the necessary technical standards. GPO already receives roughly 70 percent of incoming material in electronic format, primarily magnetic tape, and has converted entirely from hot type to electronic photocomposition (between 1976-1986). GPO has the capability to accept input in a wide range of floppy diskette formats, and is experimenting with both dial-up desktop publishing input and mainframe computer-based electronic data transfer. GPO electronic output is currently limited to several dozen magnetic tape products, including some major products such as the *Congressional Record* and *Federal Register*.

OTA's independent printing consultant concluded that as much as 60 percent of the GPO's current publications could be produced in an electronic database-oriented format, and that about half of that, or 30 percent, is "releasable" in electronic format in that the material is: (1) suited for electronic receipt; (2) not confidential or otherwise restricted; and (3) has an audience with or access to the technology needed to use the material in electronic form. While one can debate these percentages, and the methodologies used to estimate them, the results suggest significant levels of potential electronic penetration. GPO has questioned the basis for these estimates, but the difference, if any, cannot be resolved in the absence of a detailed review of a statistically valid sample of GPO's printed products. Such a review appears to be warranted, and could be conducted by SupDocs.

With respect to NTIS, constraints on capital investment have limited its deployment of new electronic technology. NTIS does serve as a clearinghouse for a variety of electronic format (machine readable) products, including about:

- 300 computer software items;
- 800 numeric and statistical databases;
- 300 textual databases; and
- 10 bibliographic databases, all provided by mission agencies.

These represent only a small fraction of total agency electronic products in these categories. NTIS could be positioned to take advantage of relevant technology applications under development and demonstration at various civilian and military agencies.

Some technologies appear to offer large potential for both SupDocs and NTIS. One of these is compact disk/read only memory (CD-ROM). The National Oceanographic and Atmospheric Administration (NOAA), Bureau of the Census, and U.S. Geological Survey (USGS) have prototyped CD-ROMs and found that disks with about 500-600 megabytes of data (equivalent to about 250,000 pages of double-spaced typed text) can be recorded on a single disk at a full cost of about $50/disk at a volume of 600. This includes $15,000 for data preparation (converting the electronic data into the format suitable for CD-ROM), $5,000 for software development (preparing the software needed for CD-ROM access), and $10,000 for the actual mastering of the first 600 disks. At a larger volume of, say, 2,000, the total would increase to about $40,000 but the per disk cost would drop to about $20. At a volume of 5,000, the total cost would be about $50,000 and per disk cost about $10. SupDocs and/or NTIS could take a lead role in facilitating the preparation and dissemination of CD-ROMs for individual agency databases and for a consortia of agencies who might wish to place a variety of databases on a single disk.

The combination of CD-ROMs, optical disk storage for large scale archiving, and electronic print-on-demand systems could revolutionize NTIS and/or SupDocs dissemination operations, especially for low volume, out-of-print, and/or reference or bibliographic material. While governmentwide standards for these (and other) technological applications are critical, it is not clear to what extent centralized production is more cost-effective. In other words, the conventional printing procurement model may not necessarily apply to electronic information product procurement. In general, however, once the content of a document, publication, or other information product is captured in a compatible electronic format, then it is easy to manipulate the contents into a variety of outputs—paper, microfiche, and electronic. In this way, the output formats can be cost-effectively tailored to particular types of products and user needs and capabilities. (See chs. 3, 4, and 5 for further discussion.)

BROADER IMPLICATIONS OF SUPDOCS/NTIS ELECTRONIC INFORMATION DISSEMINATION

Some broader implications of SupDocs/NTIS electronic dissemination, irrespective of the particular institutional structure, are considered in this section. The impact areas discussed include:

- government productivity and cost-effectiveness,
- agency missions and the role of SupDocs and NTIS,
- private sector economy, and
- other areas.

Government Productivity and Cost-Effectiveness

A major continuing concern of government officials and taxpayers is that government functions be conducted as cost-effectively as possible, consistent with other governmental objectives such as public access and open government. With respect to Federal information dissemination and related activities, there appear to be substantial opportunities for SupDocs and NTIS to improve the productivity and cost-effectiveness of government information activities. This could occur directly through their own activities and indirectly by encouraging or stimulating agency productivity improvements, and without compromising other important goals such as public access. Indeed, there is the possibility of financing enhanced public access to Federal information largely out of productivity improvements.

Numerous vendors and business users report productivity improvements of typically 30 to 50 percent and similar rates of return on investment. Payback periods are in the 2 to 3 year range. Various Federal agencies have projected similar returns in justifying equipment and systems acquisitions, and these estimates should be applicable to SupDocs and NTIS information products.

These estimates do not include other important elements of cost avoidance, such as paper and postage. Electronic publishing facilitates the use of typeset text and tables for reports (or other documents), rather than typewritten (or word processed) text and tables. The result is that the length of reports can be reduced by, on the average, about 35 percent, and thus the cost of printing (including paper) would be correspondingly reduced. The reduced length (and weight) of the report would also reduce the cost of postage for mailing the report. Again, these kinds of savings should accrue to SupDocs and NTIS information dissemination as well as to individual mission agencies.

Another potential area of cost reductions for SupDocs and NTIS document sales involves the use of CD-ROMs for dissemination of scientific, statistical, and other kinds of information that are best suited for electronic formats. For example, the full texts of patents are currently sold by the Patent and Trademark Office (PTO) at a cost of $2,250 per week for paper format, and only $345 per week in magnetic computer tape format, all priced to recover the marginal cost of reproduction. PTO estimates that the same information could be sold in CD-ROM format (one disk per week) for only $50 per week, depending on sales volume, or about 2 percent of the cost in paper format. The NOAA, USGS, and Bureau of the Census have estimated that scientific and statistical information totally unsuited for paper formats could be provided on CD-ROM at about 10 percent or less of the cost of the same information in magnetic tape format ($50 for one CD-ROM compared to $500 to $625 for 4 or 5 magnetic tapes at $125 each). These kinds of cost reductions should apply as well to electronic products sold by SupDocs and NTIS.

However, the realization of these benefits by the Federal Government is hampered by the general lack of or confusion about common technical standards to ensure compatibility and interconnectivity, inadequacy of effective mechanisms to share expertise and experience, and the like. As noted in chapters 2, 3, and 11, there are some efforts ongoing in all of these areas, but the total effort appears to be moving too slowly, especially when considering the substantial yearly investment of the Federal Government in these technologies and the large number of tests, demonstrations, and, operational applications. SupDocs and NTIS electronic dissemination programs could help stimulate faster progress in these areas.

In addition to beneficial productivity impacts on the creators and disseminators of Federal information, other alternatives that could be implemented by SupDocs and NTIS (such as the governmentwide information indexing, see ch. 11) should help improve the productivity of Federal (as well as other) users of Federal information. At present, it is difficult and time-consuming for many Federal employees to determine what relevant information is available from elsewhere within their own agency, let alone from other agencies. While there are no known estimates of the total time spent searching for information, it must be substantial. Moreover, while an improved index to major government information (in all formats) is only one part of a total solution, it should be of significant help if done well.

Estimating the productivity improvements from SupDocs and NTIS electronic dissemination activities (including related standards, innovation, and index initiatives) is very difficult if not impossible. However, given the very large government investment in relevant areas, even a small productivity improvement translates into large savings or cost avoidance.

There are several ways to estimate savings for the government, although estimating an allocation of savings to SupDocs/NTIS versus the individual mission agencies is difficult and beyond the scope of this analysis. One way to calculate savings is as a percentage of total government expenditures in relevant areas. Assuming that the government spends at least $6 billion annually on information dissemination-related functions (see ch. 2), even just a 10 percent productivity improvement, which is at the very low end of private sector estimates and experience, would translate into a potential $600 million per year productivity improvement. Even if only partially realized, this would provide a substantial opportunity for cost avoidance, budget reductions, and/or new or improved dissemination activities. For example, a one percent productivity improvement would equate to $60 million per year, which by comparison is an amount about triple the depository library program appropriation.

Other methods of estimating productivity improvement also give significant results. For example, a conservatively estimated 30,000 Federal employees are involved with information dissemination-related activities, as discussed in chapter 11. Assuming an average salary (including benefits) of $40,000 per year, the total cost would be $1.2 billion. Assuming further an average productivity improvement of 25 percent when using electronic publishing (equates to a payback period of 4 years), the potential productivity improvements or cost avoidance would be about $300 million per year for Federal salaries alone. As another example, an estimated 100,000 scientific and technical reports are produced by or for the Federal Government each year. Assuming that the average report length is 125 double-spaced typewritten pages and the average press run is 400 copies per report, then the total printing and postage cost per report would average about $1,400 per report (at $3.50 per copy or 1.6 cents per page plus $1.50 postage) or $140 million total (for 100,000 reports). Using the estimated 35 percent savings figure, the potential savings by using electronic publishing would be about $50 million annually for printing and postage alone.

Agency Missions and the Role of SupDocs and NTIS

As discussed throughout the report, Congress has assigned numerous information dissemination responsibilities to Federal agencies in the performance of their statutory missions.

In general, agency statutory missions would be enhanced by those SupDocs/NTIS alternatives that facilitate and improve the dissemination of mission-specific information to agency clientele (e.g., users, researchers, media, interest groups). To the extent this could be done more cost-effectively, agency missions would also be enhanced. Overall, the scenario that seems to have broadest support among mission agencies is the alternative that retains agency discretion to disseminate electronic information directly to agency clients, but with the central governmentwide dissemination offices (SupDocs, NTIS, or a combination thereof) having the discretion to include agency items in governmentwide sales, archiving, and distribution programs. This is somewhat similar to the way paper documents and publications are handled now. The agencies are able to distribute printed copies directly to their own clients. SupDocs "rides" the printing order for additional copies for the GPO sales program and depository library distribution, if the particular report is judged to be suitable for inclusion. NTIS receives scientific and technical information (STI) documents from the agencies, and places the materials in the archives for dissemination on demand.

At present, while many agency reports are transmitted in electronic format to GPO for printing, SupDocs does not disseminate electronic formats (with the exception of some magnetic tapes). NTIS, on the other hand, receives and disseminates about 1,400 electronic format products, although demand per product is generally low. Some agency officials expressed concern about having SupDocs disseminate their electronic format products. This appears to reflect: a desire to retain control over their own electronic products to the extent possible; concern about possible competition with SupDocs (and potential reduction in agency revenues from electronic sales); and a perception that SupDocs could not effectively maintain an electronic dissemination program.

On the other hand, under a decentralized scenario, NTIS and/or SupDocs activities would augment and supplement, not supplant, agency activities. Also, agency sales of electronic information products are, in many cases, quite modest; so the involvement of NTIS and/or SupDocs might actually stimulate greater sales and therefore greater dissemination of agency materials. The agencies probably would not receive any additional direct revenues (which would presumably be retained by NTIS/SupDocs, returned to the Treasury, or applied to offset public appropriations elsewhere).

As for concern over the capability of SupDocs and NTIS to handle electronic formats, both SupDocs and NTIS would need to obtain the necessary additional expertise. GPO as a whole is averaging about a 5 percent annual net attrition rate (250 persons a year from a current base of about 5,000), which provides considerable flexibility to hire persons with electronic information skills to the extent needed. Beyond this, as many as 10 to 15 percent of the employees in several major GPO work groups are at or near retirement age (see ch. 4). There may be additional attrition through higher retirement rates in the next few years, which would provide GPO with additional staffing flexibility. In sum, GPO is in a favorable position with respect to any necessary personnel adjustments within the current statutory ceiling on full time equivalent staff levels. Changes in or removal of the ceiling would require congressional action. The NTIS personnel situation is in a state of flux due to the uncertainties associated with the privatization debate. Morale has been adversely affected, and many employees apparently are prepared to retire or transfer to another Federal agency. A complete evaluation of NTIS personnel resources would seem prudent.

With respect to equipment (hardware, software, systems) needed for electronic dissemination activities, there would likely be the need for significant capital investment requirements on the part of SupDocs and NTIS for such things as:

- additional desktop and high-end electronic publishing units,
- graphics work stations,
- magnetic tape and floppy disk conversion and duplication equipment,

- possibly online database support capability, and
- possibly CD-ROM premastering equipment.

However, for GPO, the cost of these items is, in many cases, comparable or less than the cost of conventional printing and binding equipment. GPO currently spends about 1 percent of total revenues on capital investment ($8 million out of $800 million), which is equivalent to about 4 percent of inplant revenues. Over time, one scenario is a gradual shift in the GPO capital expenditure budget from conventional to electronic printing and publishing equipment. All major expenditures, whether for new conventional presses or CD-ROM premastering equipment and the like, would need to be carefully scrutinized to validate need and cost-effectiveness relative to other options and taking into account estimates of future demand. NTIS has not had a significant capital investment program in the past, and would need a capital program to support electronic dissemination activities.

Should SupDocs and NTIS seek a significant role in electronic dissemination, several other actions appear to be prudent. One would be the establishment of high level and well-staffed strategic planning offices in SupDocs (or GPO) and NTIS that would include expertise in technology, economics, marketing, and human resources, among other considerations. These offices would need to be permanently established. The planning offices could be tasked with developing short, medium, and long-range plans on a rolling basis. At GPO, the recent establishment of an Office of Financial Policy and Planning appears to be a step in this direction. Congress could require that periodic SupDocs and NTIS planning reports be submitted to the appropriate oversight, authorizing, and appropriations committees. A second action would be to enhance the SupDocs and NTIS research, development, and demonstration program. The few pilot and research projects underway, while noteworthy, do not have the critical mass necessary to place SupDocs and NTIS on a par with various of the Federal executive agencies (such as the Navy, DTIC, USGS). If SupDocs and NTIS aspire to—or Congress desires SupDocs and NTIS to take—a leadership role in such areas as technical standards and state-of-the-art technical applications, then a more aggressive program appears to be necessary. A third action would be to further increase the profile of SupDocs and NTIS participation in various Federal Government standards-setting and technology development activities. SupDocs and NTIS could seek formal participation in these activities, and promote or train from within or hire from the outside the best available qualified persons to participate in these forums. (See chs. 4, 5, and 7 for related discussion.)

Private Sector Economy

A major concern of the information industry, government, and others is how SupDocs and NTIS electronic dissemination programs, if implemented, would affect the economic health of the U.S. private sector economy. The private business sector has multiple interests in Federal information dissemination. First, many businesses are users of Federal information for a wide variety of purposes. Second, the equipment manufacturers and systems integrators sell the government the hardware, software, and related technologies and services that are needed to implement Federal information dissemination systems. Third, the printing industry sells composition, printing, and binding services to the government. Fourth, the information industry repackages, resells, and/or adds value to government information.

The interests of the business users of Federal information are presumably generically the same as many other users—to get the information when needed and at a reasonable price. The larger businesses with greater resources are likely to be less sensitive to price than independent small businesses, and the larger businesses also are better able to use the information industry to obtain Federal information on a resale or enhanced basis. The equipment manufacturers and related companies, while probably users of Federal information, are primarily interested in expanding and developing the government market for their technologies and services. Similarly, the printing industry largely views the Federal Government as another market segment for sales of printing services. The information industry, however, has a more complex view of its relationship to the Federal information infrastructure.

On the one hand, that portion of the information industry that makes a market in Federal information is dependent on obtaining the information on a timely and relatively inexpensive basis so that it can be repackaged, resold, and/or enhanced at a competitive price. If Federal information is available too slowly, at too high a price, and/or in a difficult format, the potential market value and profit potential of repackaging and/or enhancing that information declines accordingly. Therefore there is a clear interest in obtaining Federal information on a timely and reasonable cost basis. The industry appears to oppose (along with others) pricing of Federal information to recover some or all of the cost of developing the information, because, in many instances, that would make it too costly to repackage, resell, and/or enhance the information at a profit. The industry (and others, including libraries, researchers, public interest groups, and the like) note that the development of the information is paid for with taxpayer dollars, so charging for the information development costs would amount to paying twice.

The conflict arises when government information is made available in electronic form. The information industry apparently does not see paper formats as a competitive threat, but not so for electronic formats. This is because it is the electronic form (and format) that permits the information industry and others to repackage and enhance the information. Thus users who want and can afford the advantages of electronic information (e.g., such as timely search and retrieval capability) provide the primary market for information industry products and services. As a result, proposals to make Federal information available in electronic form directly from the government (e.g., via individual agencies and the depository library program as well as SupDocs and NTIS) have raised serious concerns on the part of OMB, information industry trade associations, and some individual companies.

The primary information industry concern is over a possible adverse impact of government-provided electronic information on information market opportunities. OMB and information industry representatives make a distinction between government dissemination of Federal information in raw electronic form (e.g., on a magnetic tape or floppy disk) without software enhancements or searching aids, which OMB and the industry representatives support, and government dissemination of enhanced or so-called "value added" information, which at least some in OMB and the industry oppose. This places information industry companies in the position of advocating dissemination of raw electronic formats which they can use as resellers and value adders (because the electronic formats are much cheaper to work with and minimize costly rekeyboarding), but apparently resisting sales of enhanced electronic formats by individual agencies or government-wide dissemination agencies (such as SupDocs or NTIS) directly to the public.

The industry position raises several issues. First, historically the government has produced and disseminated a wide range of enhanced or value-added information products in paper format. These include, for example, statistical analyses and projections (e.g., from the Bureau of Labor Statistics and Bureau of the Census), natural resource trends and projections (e.g., from USGS), domestic and international commodity demand, supply, and price fluctuations (e.g., from the U.S. Department of Agriculture), and domestic and international market trends and forecasts (e.g., from the Department of Commerce). Thus the government has a long-established role in providing enhanced information products.

Second, increasingly, users are seeking these information products in electronic formats, in order improve the timeliness, accessibility, and/or manipulability of the information, and/or because the information is available only in an electronic format. Limiting the government to electronic dissemination of only the raw information would be akin to distributing the words of a book without the page and chapter formats or the table of contents and index, or to distributing statistical data without the tables, figures, or summary presentations and analyses. Limiting the government's role to raw electronic data could aggravate concerns about equity of information access and impair the performance of agency missions and governmental functions.

Third, although OMB circular A-130 asserts that information dissemination is subject to OMB circular A-76 on contracting out, and that "maximum feasible reliance" should be placed on the private sector, neither of these circulars nor any other governmentwide policy guidance define under what conditions enhanced or value-added electronic information products are inherently or appropriately governmental versus commercial in nature. (See ch. 11 for further discussion.)

In terms of the various alternatives discussed in chapter 11, it does not appear that the business community has any serious objections to and indeed, supports technical standards, innovation centers, improved Information Resources Management (IRM), and electronic FOIA (also see ch. 9) as they relate to information dissemination. Many of these would benefit the business community as taxpayers through improved government productivity, and as corporate citizens interested in an open government. The governmentwide information index and electronic press release service (also see ch. 10) likewise appear to raise relatively minor objections, although information industry representatives have noted that these offerings could be (and to some extent already are) provided by private vendors independently or under contract to the government. The major industry objections seem to arise with respect to electronic dissemination of enhanced Federal information via SupDocs, NTIS, and DLP (also see chs. 6 and 7), and also by mission agencies with respect to specific enhanced information products that are perceived as having significant market value.

Analysis of possible economic impacts suggests the following general results. The general business user community would appear to, if anything, benefit from the availability of enhanced electronic formats via SupDocs and/or NTIS, especially small business. (Small business might also benefit from depository library dissemination.) Business users already are the major customers of both SupDocs and NTIS, accounting for about 75 percent of SupDocs subscription sales customers, 45 percent of SupDocs publication sales customers, and 65 percent of NTIS customers.

Except as users of Federal information (e.g., for strategic planning or research and development purposes), it does not appear that the information technology equipment and services industry or the printing industry would be significantly affected. The information technology industry already realizes conservatively $8 billion per year in sales to the Federal Government, and it is hard to see how this would be affected by SupDocs/NTIS electronic dissemination. Also, even the $8 billion is but a small fraction (about 4 percent) of the $200 billion annual U.S. market (for computer and business equipment, software, and services). Likewise, the U.S. printing industry's current Federal market share is about $600 million annually or roughly one percent of total annual industry revenues of about $55 billion. Conceivably, this market share could decrease slowly over time, should SupDocs/NTIS increase electronic products at the expense of paper products. However, the impact on the printing industry's revenues would appear to be marginal to insignificant.

The information industry is the one area where some adverse economic impact might be anticipated. While the information industry includes a variety of traditional paper document and microform services, the most dynamic and dominant sector of the industry is the online database business. CD-ROM business may also become significant, but today is just emerging as a viable electronic format. The online database industry provides a reasonable basis for estimating the relative impact of SupDocs/NTIS enhanced electronic offerings.

The growth of the online database market segment of the information industry has been phenomenal. From less than $500 million in annual revenues in 1978, this segment has grown to about $3 billion total revenues in 1987 and is projected to reach about $4 billion by the 1990-1991 time frame. This reflects, in part, an increase in the number of databases, from about 400 in 1979-1980, to 1,350 in 1982-1983 to about 2,900 in 1986, and about 3,500 in 1987. As of early 1987, financial and credit information accounted for almost three-fifths of all online database revenues. Business and industrial information (including real estate and economics) accounted for about another one-fifth. Legal information accounted for about one-tenth, and scientific and technical information for about one-twentieth. This leaves about 5 percent for all other types of information, including library support (about 2 percent), consumer (about 1 percent), and governmental (about 1 percent) information. Thus, government information per se appears to directly represent a very small portion of total online database revenues. However, it should be noted that some of the other types of databases presumably utilize government information, although not as a major product offering.

Taking as a rather improbable example, if one-fifth of the NTIS and SupDocs sales were converted to online database sales, this would amount to about $20 million annually, or less than one percent of the 1987 online industry, a very small segment of the total online market. In reality, it would take NTIS/SupDoc several years to reach $20 million annual online revenues, if then. By that time, say 1990-1991, the online industry likely would have grown to $4 to 5 billion and the NTIS/SupDocs market share would be down to less than one-half of one percent.

Thus it would not appear that SupDocs/NTIS offering of electronic formats would pose any significant competitive or economic threat to the online industry as a whole. However, the hypothetical $20 million SupDocs/NTIS market share would be somewhat more significant (about 4 percent) when compared to the combined market share of legal, scientific and technical, and purely governmental online services (all grouped together as loosely governmental, about 15 percent of the total online market), and would be very significant when compared to the purely governmental segment alone. SupDocs/NTIS involvement in enhanced electronic dissemination is not a realistic threat, or even a significant potential competitor, to the information industry as a whole, but could have a significant impact on the small segment of the industry and those relatively few firms that specialize in government information.

Of course, the impact need not necessarily be negative. The availability of enhanced electronic products may open up new opportunities for repackaged and further enhanced private offerings and could stimulate the overall market, with a net gain for the private firms. Moreover, there is also the option of government contracting with various of these firms.

The online *Congressional Record* illustrates how commercial vendors could be involved as government contractors. The *Record* is printed by GPO, sold by SupDocs, and distributed in paper (and some microform) to members of Congress, congressional committees and offices, other designated government officials and agencies, and participating depository libraries. GPO also sells magnetic tapes of the *Record* to vendors. Vendors then enhance the database and place the *Record* online as a commercial offering, at typical yearly subscription rates of $3,000. As discussed in more detail in chapters 4, 7, and 8, depository libraries and others have expressed strong interest in the *Record* online, but many cannot afford the commercial rates.

One alternative would be for GPO, the House Information Systems office, the Library of Congress, or some other congressional agency to provide the *Record* online at no or reduced charges to the libraries. However, another alternative would be for Congress to contract with one or more vendors for some or all of this service. Vendors have indicated that they would offer a heavily discounted bulk rate for the depository library program. Indeed, a pilot project testing this concept is underway with 50 depository libraries participating. For example, for 1,400 access accounts with a maximum simultaneous sign-on of 70 libraries, the estimated annual fee would be about $300 per library, or only 10 percent of the full rate. If the number of simultaneous sign-on libraries were 280, the annual fee would be about $1,000, which is still only one-third of the full rate. This type of scenario could benefit both the libraries and the industry. Nonetheless, the possibility—however remote—of adverse effects on innovation and competition in the industry is yet another reason for consideration of congressional policy alternatives discussed in chapter 11 (and in ch. 8 with regard to congressional information and ch. 7 on the depository library program).

Other Implications

Electronic dissemination of Federal information by SupDocs and NTIS has implications for several other areas. These areas are summarized briefly below.

State/local government use. OTA's commissioned research[2] on state/local government use of Federal information concluded that current Federal systems for disseminating information are not adequately serving state/local needs. State/local officials were skeptical about major government reorganization and point to failed state efforts to establish strongly centralized information dissemination offices. However, officials were generally supportive of alternatives such as the electronic information index, common technical standards (as long as they were developed with meaningful state/local participation), and other measures to improve access to Federal information in all formats—including electronic.

The dissemination of electronic formats by SupDocs and NTIS should improve the ability of State and local governments to learn about and obtain desired Federal information. In order to help ensure that State/local information needs are considered, SupDocs and NTIS could include representatives of State/local governments as participants in user forums, marketing surveys, and advisory panels for electronic dissemination. The related activities of some Federal mission agencies, such as the Bureau of the Census and the Agricultural Extension Service, could be used as prototypes for SupDocs and NTIS. Also, several States have their own innovative electronic dissemination activities, which may be adaptable for use by SupDocs and NTIS as well as Federal mission agencies.

Access by disabled persons. Another area of particular note is the potential of electronic formats to significantly improve access to Federal information by physically disabled persons. OTA's staff research[3] found that many impaired individuals are handicapped with respect to obtaining Federal information, for example, because paper formats cannot be read by the blind (with the exception of the limited amount of material in braille) or manipulated by those with serious impairment of the upper extremities. With the advent of Federal information in electronic form, the potential exists to geometrically increase the amount of information accessible to disabled persons through the use of specially adapted microcomputers, optical disks, floppy diskettes, and related electronic technology.

The dissemination of electronic formats by SupDocs and NTIS should improve the ability of disabled persons to obtain and use Federal information, as would electronic dissemination by Federal mission agencies. Electronic access could significantly increase the functional mobility, capability, and productivity of these individuals.

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[2] Mark Haselkorn, Philip L. Bereano, and Barbara Lewton, "Perspectives of State and Local Governments," OTA contractor paper, October 1987.

[3] Carol Nezzo, "Access to Federal Information by Physically Handicapped Persons," OTA staff paper, June 1987.

The primary technological window for disabled persons is the microcomputer. Through use of a microcomputer, disabled persons can access online databases, electronic mail and bulletin boards, CD-ROMs, and the like. Microcomputers can be adapted to make them useable through special applications software, special systems software, and hardware adaptations or devices (such as a keyguard, keylatch, optical printer, over and undersized keyboard, or smart keyboard) that permit the disabled person to use standard software running on a standard microcomputer.

The keys to realizing this potential are: 1) the availability of Federal information in electronic formats; 2) the availability of relatively low-cost microcomputers and adaptive software and devices; 3) the development of standards for microcomputer keyboards and physical design to ensure that microcomputers are compatible with adaptive devices; and 4) the development of standards on text markup and page description. Items 2 and 3 above are being implemented through the joint efforts of the disabled community, equipment manufacturers, researchers, and Federal agencies (especially the General Services Administration, Veterans Administration, and Department of Education). SupDocs and NTIS could play a significant role in items 1 and 4, along with the mission agencies and the National Bureau of Standards. In order to help ensure that the needs of disabled persons are met, disabled persons could be included in SupDocs and NTIS user forums, marketing surveys, and advisory panels.

Electronic archiving. To be complete, the disposition of information should be included as an integral part of the information life cycle. The National Archives and Records Administration has responsibility for archiving of Federal records that have permanent value. NARA archives records in all standard formats—including paper, microform, and machine readable. As the Federal agencies increase their use of electronic formats, archival procedures will need to be continuously reviewed and updated to ensure that the accuracy, integrity, and completeness of the records are maintained even when in electronic form.

NARA is in the process of issuing updated draft regulations on the maintenance, retention, and disposition of electronic records. The proposed regulations will cover such topics as:

- creation and use of databases and numeric data files, including the need for adequate and up-to-date documentation;
- creation and use of text information in office automation systems;
- selection and maintenance of electronic storage media, including consideration of longevity, cost, portability, and the like;
- retention of electronic records; and
- destruction of electronic records.

The implications of SupDocs and NTIS sales of electronic formats are two-fold. First, ideally, technical standards should be consistent through all stages of the information life cycle—from creation to processing to dissemination to disposition. SupDocs and NTIS involvement in electronic dissemination, along with mission agencies, could provide an opportunity to help ensure that dissemination needs are fully considered. Second, to the extent SupDocs and NTIS offer databases, numeric data files, and the like in a variety of electronic storage media, SupDocs and NTIS sales programs could include a larger percentage of Federal information that currently is available primarily only through Freedom of Information Act requests (for active databases) or searches of NARA archives (for inactive and archived databases).

International leadership. OTA's commissioned research[4] on foreign government information dissemination activities concluded that the U.S. Government currently has a leadership position with respect to electronic dissemination, followed by the European Economic Community, Canada, other European nations, and Japan in that order. SupDocs and NTIS involvement in electronic dissemination could help further strengthen this leadership position through:

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[4] Thomas B. Riley, "A Survey of International Trends in Government Information Dissemination," OTA contractor paper, November 1987.

- SupDocs/NTIS participation (along with other Federal agencies) in international standards-setting activities,
- SupDocs/NTIS demonstrations of how legal and institutional protections for public access can be extended to an electronic information environment, and
- an enhanced SupDocs/NTIS role in stimulating the domestic economy through improved government information dissemination and the creation of new value-added opportunities for the information industry.

On the other hand, there is some concern that with a strengthened SupDocs/NTIS role, U.S. Government information might become even more accessible to adversaries. As it is, foreign nations and corporations have much easier access to U.S. information than does the U.S. Government (and corporations) to foreign information. Since information is an important tool in international economic and political competition, further increases in the information gap could adversely affect the U.S. competitive position. While this concern has been strongly articulated by U.S. military and intelligence agencies, the factual basis has not been well established.

The institutional, technical/management, and policy alternatives considered in this report are focused on the dissemination of "public" information, defined as Federal information that is not classified, proprietary, or private in nature (or subject to any other exemptions under the Freedom of Information Act). Thus, for example, classified information is screened out of SupDocs and NTIS sales programs at the outset, so greater involvement of these dissemination agencies in electronic dissemination should have no effect on foreign access to U.S. Government classified information.

Concern has also been expressed about dissemination of Federal information that is unclassified, but that is subject to U.S. export control laws. Here again, the governmentwide dissemination agencies such as SupDocs and NTIS are secondary sources of information. The original sources are the mission agencies themselves. Two problems have arisen. One is the concern that foreign nations who are subject to export controls may be able to get restricted Federal information from third party foreign nations or companies or from U.S. domestic nongovernmental sources. A second is that the secondary dissemination agencies may not fully implement restrictions on source agency information. While these may be legitimate policy problems, they exist irrespective of the format of the information. Access via third parties (whether foreign or domestic) is very difficult to control at best, and electronic dissemination could aggravate this problem. However, limiting the roles of SupDocs/NTIS (as well as the mission agencies) in electronic information dissemination would run a high risk of handicapping U.S. domestic companies (and the U.S. public) and U.S. allies far more than U.S. adversaries. As for SupDocs and NTIS compliance with export control requirements, interagency policy coordination would seem to be the appropriate avenue rather than across-the-board limitations on electronic dissemination. Only a very small percentage of SupDocs and NTIS materials would seemingly be subject to export controls in the first place.

A final, and perhaps most difficult, dimension of concern involves unclassified and unrestricted, but so-called "sensitive", Federal information. Some Department of Defense officials have argued that certain unclassified, unrestricted Federal information, such as economic or agricultural statistics when aggregated and disseminated in electronic formats (especially online databases), becomes sensitive for national security purposes. Sensitive means that foreign adversaries would gain significant advantages from accessing the information in electronic form, presumably on a more timely and integrated basis than would otherwise be possible. Defense and intelligence agency efforts to monitor foreign access to U.S. commercial and governmental unclassified online electronic databases have met with heavy opposition from the civilian agencies, library and research communities, and U.S. information industry. The industry has responded that such monitoring and potential control of unclassified, legally unrestricted Federal information is not only a threat to open government and a freely competitive marketplace, but could have a seriously adverse economic effect on the industry. Nonetheless, a significantly enhanced SupDocs/NTIS role in electronic dissemination could aggravate defense community concerns.

Related issues are examined in five prior OTA reports:

- *Federal Government Information Technology: Management, Security, and Congressional Oversight*, OTA-CIT-297, February 1986;
- *The Regulatory Environment of Science*, OTA-TM-SET-34, February 1986;
- *Commercial Newsgathering From Space*, OTA-TM-ISC-40, May 1987
- *Defending Secrets, Sharing Data*, OTA-CIT-310, October 1987;
- *Science, Technology, and the First Amendment*, OTA-CIT-369, January 1988.

These reports should be consulted for further discussion.

Appendixes

Appendix A

Acknowledgments

OTA acknowledges with appreciation the contributions of numerous individuals and organizations to this report. The contributions ranged from review of draft materials to participation in meetings and workshops to the provision of technical information. The views expressed in the report are, however, those of OTA and not necessarily those of participants, reviewers, and other contributors.

The participants in several OTA project working groups are listed below, followed by listings of reviewers and other contributors, with separate listings for the U.S. Government Printing Office, General Accounting Office, and other OTA staff (in addition to those listed in the front of the report). Note that two OTA contractors, Stephen Frantzich of Congressional Data Associates and Jacob Ulvila of Decision Science Consortium, Inc., participated in most working groups.

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Appendix B

Contributing Authors

This report is the product of several contributing authors. Fred B. Wood, OTA, wrote chapters 1-5, 11, and 12. Prudence S. Adler, OTA, wrote chapters 6, 7, and 8. And Jamie A. Grodsky, OTA, wrote chapters 9 and 10. Chapter 3 incorporated the results of an OTA staff paper on information formats prepared by Darlene Wong. Chapter 4 incorporated results of an OTA staff paper on GPO operations and services prepared by Carol Nezzo. And chapter 8 drew on OTA contractor papers on congressional information prepared by Stephen Frantzich. The results of the GAO surveys of Federal agencies and Federal information users, OTA contractor papers (including those listed in Appendix C), and information provided to OTA directly by GPO and NTIS, and others listed in Appendix A, were incorporated to the extent appropriate in drafting the various chapters.

Appendix C

List of Contractor Reports

Copies of the following contractor reports completed in support of this assessment will be available in late 1988 from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4650. The views expressed in these reports are those of the contractors and not necessarily those of the OTA, Technology Assessment Board, or U.S. Congress.

1. Gregory Giebel, University of the District of Columbia, "Technological Changes at the Government Printing Office and Their Impacts Upon Workers," contractor report prepared for OTA, January 1988.
2. Stephen Frantzich, Congressional Data Associates, "Public Access to Congressional Information in the Technological Age: Case Studies," contractor report prepared for OTA, September 1987.
3. Stephen Frantzich, Congressional Data Associates, "Public Access to Congressional Information: The Potential and Pitfalls of Technology Enhanced Access," contractor report prepared for OTA, January 1987.
4. Stephen Frantzich, Congressional Data Associates, "Public Access to Congressional Support Agency Information in the Technological Age: Case Studies," contractor report prepared for OTA, November 1987.
5. Mark P. Haselkorn, Philip L. Bereano, and Barbara Lewton, University of Washington, "Perspectives of State and Local Governments on Federal Information Dissemination," contractor report prepared for OTA, October 1987.
6. Thomas B. Riley, Riley Information Services, "A Survey of International Trends in Government Information Dissemination," contractor report prepared for OTA, November 1987.
7. Frank J. Romano, "Decision Analysis Framework for GPO Strategic Alternatives," contractor report prepared for OTA, January 1988.
8. Jacob Ulvila, Decision Science Consortium, Inc. "Decision Analysis of Alternatives for Federal Information Dissemination," contractor report prepared for OTA, December 1987.

Appendix D

Some Key Terms and Definitions

This report uses a number of terms whose definitions are important in order to facilitate understanding. Some of these key terms are introduced here. The definitions provided are functional, not legal.

Federal *information*—information collected and/or developed by agencies of the U.S. Government as part of official agency responsibilities. Federal information includes knowledge or intelligence, such as facts, data, or opinions, in numerical, graphic, or narrative forms, regardless of mode or medium by which it is maintained or communicated. Thus, Federal information can be statistical data on a floppy disk or in a hardback book, or agency regulations on a CD-ROM or in a paper pamphlet. This report focuses primarily on Federal information that is public (e.g., not subject to FOIA exemptions for personal, proprietary, or classified information).

Printing—Federal information can be printed, published, and disseminated, although the distinctions between the latter two terms can be rather artificial. Printing is the process of stamping, impressing, or copying information in the form of letters, numbers, graphics, and the like on some kind of surface, such as paper or microform. In traditional ink-on-paper printing, paper is pressed against an inked printing surface to make copies or impressions of the original informational material. The inked printing surface or plate is typically made by creating a picture of the original on a photosensitive surface (the plate). Printing as a term is typically used to include all steps in the printing process, from layout and composition to binding. Layout is the planning or designing of the arrangement of material to be composed and printed. Composition is the production and arrangement of typographic characters or type for printing. Binding is the tieing together or compiling in a bound form of the printed pages of a book, pamphlet, and the like.

Publishing—is the overall process of creating, reproducing, and releasing or issuing informational material for sales or distribution. In the Federal Government, the publishers are generally considered to be the agencies that originate or create the material for sales or distribution. The publishing agencies provide the original material (to be typeset or camera-ready), specify the format and number of copies to be printed (usually by or through GPO for ink-on-paper printing, and occasionally by agency inhouse print shops), and handle the sales and distribution of copies from the agency. Sales and distribution of some documents are handled by the Superintendent of Documents. For scientific and technical material, copies may be provided to NTIS for archiving and sales on demand.

Information dissemination—the process by which information is actively distributed to the public by government agencies or through other mechanisms or channels (including the private and not-for-profit sectors). Information is disseminated in a variety of formats and media, and in such a way that the interested public can readily become aware of the availability of such information. Thus, dissemination focuses on the output part of the informational process, while printing focuses on the processing or reproduction of the information into a form suitable for distribution, and publishing includes the creation of the information as well as its reproduction and distribution. Examples of Federal dissemination mechanisms include the SupDocs and NTIS sales programs, Consumer Information Center (for distribution of consumer pamphlets produced by agencies), Depository Library Program (for distribution of agency publications to participating libraries), and the various agency information centers and information clearinghouses.

Information access—the process by which individuals can obtain Federal information on their own initiative. The most frequently cited mechanism for such access is the Freedom of Information Act (FOIA). However, this report uses the broader concept of information access to include anything that facilitates the ability or freedom of the public to obtain Federal information. In this sense, facilitating public access to Federal information is accomplished in large measure by Federal printing, publishing, and dissemination activities as well as by access mechanisms such as FOIA.

The major part of this report examines the alternatives and issues associated with extending the concepts of printing, publishing, and dissemination from traditional ink-on-paper forms of informational material to electronic forms. In this report, electronic printing, electronic publishing, and electronic dissemination are defined as follows.

Electronic printing—the process of electronically creating or copying images of information in the form of letters, numbers, graphics, and the like on some kind of surface. For example, in laser printing, the digitized information is fed to a laser that creates a dot-matrix image either directly on photosensitive paper, or indirectly on a photo-receptor device in the printer that transfers or "prints" the image onto paper. In impact printing, the digitized information is fed to a microcomputer chip that drives a printing head (e.g., a daisy wheel), which in turn impresses or stamps the information on a surface such as paper.

Since both ink-on-paper printing and electronic printing typically use electronic photocomposition, the major difference is that electronic printing eliminates the need for creating photo-negatives and printing plates and using printing ink and mechanical presses to transfer images onto paper. Another major difference is that with electronic printing, the images can be transferred to a variety of other surfaces besides paper. These include magnetic tape, floppy disks, and optical disks, where the digitized information is transferred in digital form onto a surface that is magnetically or optically sensitive and then "printed" by electromagnetic or laser devices.

Electronic publishing—is the use of electronic forms of information throughout the entire publishing process, from creation, editing, and revision, to printing and distribution. "Electronic publishing" is frequently used synonymously with electronic printing. Thus, so-called desktop publishing is a version of electronic printing that permits iterative electronic composition and page layout by the author or originator of the informational material, its display on a computer screen (i.e., in so-called "soft" electronic form), its reproduction on paper or in electronic form, and the distribution of the "printed" material electronically if desired (e.g., remote locations and/or by printing-on-demand). The term "desktop" simply means that all of this can be done with relatively low-cost microcomputers, terminals, laser printers, telecommunication lines (if needed), and the necessary software. So-called "high-end" electronic publishing systems perform the same generic functions, but can handle more complex, higher volume, and/or longer informational materials. These systems usually can handle considerably more information, and require specialized expertise on the part of equipment operators. (See ch. 3 for further technical discussion of desktop and high-end electronic publishing and related technologies.)

Electronic dissemination—the active distribution of information to the public by government agencies or through other mechanisms and channels (including the private and not-for-profit sectors) using electronic formats, such as magnetic tapes, floppy disks, optical disks, online, and remote printing-on-demand. It also includes advising the public of the availability of such information. Electronic dissemination presumes electronic printing of the tapes and disks, and the distribution of copies printed remotely. Electronic dissemination is compatible with, but does not require, electronic publishing in the sense that the information does not have to be created in electronic form for it to be converted later into an electronic format suitable for distribution.

For further discussion of technical terms used in this report, see chapter 3.

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